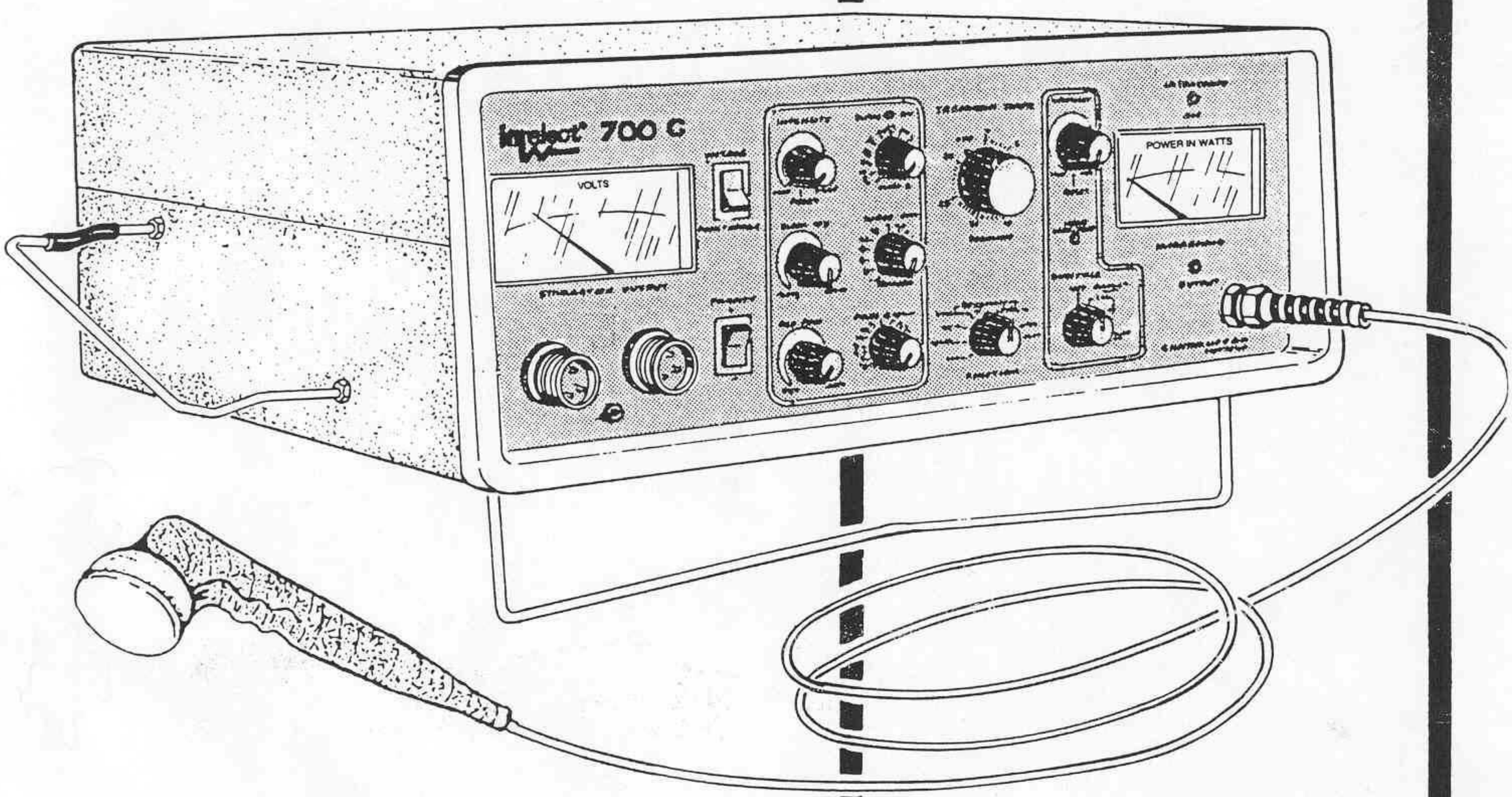
# intelect® model 700-C




# OPERATOR'S and SERVICE MANUAL

- INSTALLATION
- OPERATION
- MAINTENANCE
- PARTS

CHATTANOOGA
GROUP, INC.

P.N. 76066 Rev. B 11/93

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# SECTION 1

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# Chattanooga Group, Inc.

## 12 Month Warranty

Chattanooga Group, Inc. ("Company") warrants that the Intelect® Model 700-C™ ("Product") is free of defects in material and workmanship. This warranty shall remain in effect for one (1) year from the date of original consumer purchase of this Product and extends to any owner of the Product during the warranty period. If this Product fails to function during the one year warranty period because of a defect in material or workmanship, Company or the selling dealer will replace or repair this Product without charge within a period of 30 days from the date on which the defective Product is returned to the Company or the dealer. Company or the dealer will ship the replacement or the repaired Product to the consumer's residence.

### This Warranty Does Not Cover:

1. Replacement parts or labor furnished by anyone other than the Company, the dealer or an approved Company service agent.
2. Defects or damage caused by labor furnished by someone other than Company, the dealer or an approved Company service agent.
3. Any malfunction or failure in the Product while it is in the possession of the owner during the warranty period if the malfunction or failure is not caused by a defect in material or workmanship or if the malfunction or failure is caused by unreasonable use, including the failure to provide reasonable and necessary maintenance.

**Company shall not be liable for incidental or consequential damages to property or business.**

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

TO OBTAIN SERVICE from Company or the selling dealer under this warranty, the owner must do or abide by the following:

1. A written claim must be made within the warranty period to Company or the selling dealer. If the claim is made to the Company, the written claim should be sent to:
   4717 Adams Rd./P.O.Box 489, Hixson, TN 37343. Phone: (800) 592-7329.
2. The Product must be returned to Company or the selling dealer by the owner.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

The Company does not authorize any person or representative to create for it any other obligation or liability in connection with the sale of the Product. Any representation or agreement not contained in the warranty shall be void and of no effect.

# Foreward

This manual has been written for the owners and operators of the Intelect® 700-C™. It contains general instructions on operation, precautionary practices, maintenance and parts information. In order to obtain maximum life and efficiency from your Intelect® 700-C™ and to aid in the proper operation of the unit, read and understand this manual thoroughly and become totally familiar with the controls on the panel and the various electrodes that come with the unit before operating it. The specifications put forth in this manual were in effect at the time of publication.

# Precautionary Instructions

1. **CAUTION:** Read, understand and practice the precautionary and operating instructions. Know the limitations and hazards associated with the Intelect® 700-C™. Observe the precautionary and operational decals placed on the unit.
2. **CAUTION:** The Intelect® 700-C™ should not be connected to any other unit when in use. Do not operate the unit in an environment of shortwave diathermy use.
3. **CAUTION: Federal law restricts this device to sale by, or on the order of, a physician or licensed practitioner.**
4. **CAUTION:** The generator should be routinely checked before each use to determine that all controls function normally; especially that the INTENSITY controls do properly adjust the INTENSITY of the ultrasonic power and voltage stimulation outputs in a stable manner. Also, determine that the TREATMENT TIME control does actually terminate ultrasonic power and voltage stimulation outputs when the timer reaches zero.
5. **CAUTION:** Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous exposure to ultrasonic energy.
6. **WARNING:** Explosion hazard if used in the presence of flammable anesthetics. The warning symbol for this hazard is displayed on the front bezel.
7. **WARNING:** For continued protection against fire hazard, replace fuses **ONLY** with ones of the same type and rating.
8. **WARNING:** Make certain that the unit is electrically grounded by connecting only to a grounded electrical service receptacle conforming to the applicable national and local electrical codes.
9. **WARNING: This device should be used only under the continued supervision of a physician or licensed practitioner.**
10. **WARNING:** This device should be kept out of the reach of children.
11. **WARNING:** Do not connect to a power supply before checking the position of the voltage selection switch (115 VAC or 230 VAC). Damage to the unit may result.

The Intelect® 700-C™ is a combination ultrasound and electrical muscle stimulator designed to deliver therapeutic deep heat and muscle stimulation. These treatment modalities can be delivered simultaneously in the combination mode or separately in their respective modes.

# Indications For Ultrasound Therapy

Ultrasound diathermy for use in applying deep heat can be used for treatment of selected medical conditions such as the relief of pain, muscle spasms and joint contractures. These conditions may be associated with adhesive capsulitis, bursitis with slight calcification, myositis and soft tissue injuries. The Intelect® 700-C™ can provide therapeutic deep heating between 40° – 45° C.

## Contraindications for Ultrasound Therapy

Ultrasound should not be used over:

- An area of the body where a malignancy is known to be present.
- The eyes.
- The reproductive organs.
- An acute infection or sepsis.
- A pregnant uterus.
- Deep vein thrombosis.
- An arterial disease.
- An anesthetized area or condition that causes impairment of sensation, such as chemotherapy.
- The epiphyses of skeletally immature children.
- The thoracic area if the patient is using a cardiac pacemaker.
- A healing fracture.
- Ischemic tissues in individuals with vascular disease where the blood supply would be unable to follow the increase in metabolic demand and tissue necrosis might result.

## Precautions for Ultrasound Therapy

Precautions should be taken when used:

- For acute conditions of bursitis and tendinitis that can be exasperated by the use of ultrasound.
- Over an area of the spinal cord following a laminectomy, (i.e., when major covering tissues have be removed).
- On patients with a tendency toward hemorrhaging.

# Instructions for Muscle Stimulation Therapy

1. Know stimulation characteristics, parameters, indications and contraindications.
2. Be sure to use electrode pads that are clean, moist and firmly attached to the patient. Verify that the leads and pads are plugged together securely.
   A. Use carbonized rubber electrodes in areas where they can be secured well with firm, uniform contact, such as extremities or the midsection of the trunk. A conductive medium, such as a water saturated sponge or an electrically conductive gel, should be used at the skin-pad interface, particularly in areas where hair is prevalent.
   B. If self-adhesive electrodes are used, they should be adhered to clean, dry skin. Wipe the skin area clean with alcohol or soap and water before securing the electrodes. Do not use electroconductive spray on the electrodes. Make sure the entire electrode surface is adhering to the skin before starting stimulation. Press or rub the electrode against the skin.
3. **Avoid placing pads over areas of scars, moles, discolorations, skin folds/creases, or impaired sensation unless low amplitudes are used and the skin is examined carefully. Removal of hair should be done by clipping rather than by shaving.**
4. **Remember that most patients are totally unfamiliar with electrical stimulation and some of them will have anxieties during the initial sensations. If the patient is overly fearful, either discontinue the first treatment or set the AMPLITUDE at a level where the patient just feels the current. Usually, low amplitude stimulation results in gradually increased tolerance.**

## Indications for Treatment

- For temporarily relaxing muscle spasms.
- For increasing localized circulation.
- To assist in re-educating muscles that have atrophied from disuse or injury.
- For helping to prevent post-surgical phlebo-thrombosis through stimulation of calf muscles.
- For relief of chronic, intractable pain and acute, post-traumatic pain.
- Maintaining or increasing range of motion.

This device should only be used under medical supervision for adjunctive therapy for the treatment of medical diseases and conditions.

## Contraindications

This device should not be used on patients with demand cardiac pacemakers.

This device should not be used on cancer patients.

## Warnings

1. The long-term effects of chronic electrical stimulation are unknown.
2. Safety has not been established for the use of therapeutic electrical stimulation during pregnancy.
3. Adequate precautions should be taken in the case of persons with suspected heart problems.
4. Adequate precautions should be taken in the case of persons with suspected or diagnosed epilepsy.
5. Do not stimulate over the carotid sinus nerve, especially in persons with a known sensitivity to the carotid sinus reflex.
6. Severe spasms of the laryngeal and pharyngeal muscles may occur when the electrodes are positioned over the anterior neck or mouth. The contractions may be strong enough to close the airway or cause difficult breathing.
7. Therapeutic electrical stimulation should not be used transcerebrally.
8. Therapeutic electrical stimulation should not be applied over swollen, infected or inflamed areas of skin eruptions, e.g., phlebitis, thrombo-phlebitis and varicose veins.
9. Caution should be used in the transthoracic application of therapeutic electrical stimulation devices in that introduction of electrical current into the heart may cause arrhythmias.
10. Therapeutic electrical stimulation devices should be kept out of the reach of children.

## Precautions

Precautions should be observed in the presence of the following:

1. When there is a tendency to hemorrhage following acute trauma or fracture.
2. Following recent surgical procedures when muscle contraction may disrupt the healing process.
3. Over the menstruating uterus.
4. Where sensory nerve damage is present by a loss of normal skin sensation.
5. Some patients may experience skin irritation or hypersensitivity due to the electrical stimulation or the electrical conductive medium. The irritation can usually be reduced by use of an alternative conductive medium or alternate electrode placement.

## Adverse Effects

Skin irritation and burns beneath the electrodes have been reported with the use of therapeutic electrical stimulators.

# Installation

Remove the Intelect Model® 700-C™ and any additional items ordered with the unit from the carton and inspect for damage that may have occurred during shipment.

The following is a list of accessories that should be included with the unit as standard accessories.

| Qty. | Description | Catalog No. |
|---|---|---|
| 1 | Hand-Held Probe | 79001 |
| 1 | Rectangular Applicator for Probe | 79008 |
| 1 | Sponge for Rectangular Applicator | 79062 |
| 1 | Spot Applicator for Probe | 79005 |
| 1 | Sponge for Spot Applicator | 79059 |
| 2 | Active Electrode Pads, 3" Red Round | 72853 |
| 2 | Active Electrode Pads, 3" Black Round | 72852 |
| 1 | Active Electrode Pad, 4" Red Round | 72851 |
| 1 | Active Electrode Pad, 4" Black Round | 72850 |
| 1 | Dispersive Electrode Pad, 8 x 10 inch | 72854 |
| 1 | Sponge for Dispersive Pad | 79061 |
| 1 | Active Lead, Red and Black (72") | 71777 |
| 1 | Dispersive Lead (72") | 72955 |
| 1 | Active Lead, Red Bifurcated (18") | 72849 |
| 1 | Active Lead, Black Bifurcated (18") | 72855 |
| 1 | Active Lead, Green Bifurcated (18") | 72855 |
| 1 | Active Lead, Red (18") | 72953 |
| 1 | Active Lead, Black (18") | 72954 |
| 2 | Short Nylatex Straps 2.5" x 24" | 10648 |
| 1 | Long Nylatex Strap 2.5" x 48" | 10832 |
| 1 | Instruction Booklet | 74470 |
| 1 | Dispersive Electrodes (1.5" x 3.5") | 75284 |
| 1 | Ultrasound Gel (Packaged in dozens for reorder) | 4264 |

**⚠ CAUTION** Before connecting to a power supply, check the position of the voltage selection switch (Figure 1) located at the back of the unit. The unit will operate on either 115 VAC ± 15 V, 60 Hz, or 230 VAC ± 15, V 50 Hz when switched for the appropriate voltage. The unit may be damaged if the wrong voltage is selected. DO NOT attempt to use Direct Current. To operate in the U.S. on 230 VAC, the plug must be replaced with a UL listed "Hospital Grade" NEMA 6-15 style plug. Follow the procedures indicated in the Precautionary Instructions. DO NOT attempt to use unit if is not properly grounded.

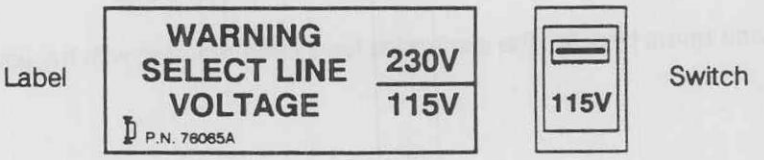


**Figure 1**

# Ultrasound Specifications

| | |
|---|---|
| Frequency | 1.0 MHz ± 5% |
| Duty Cycle | 100% (continuous mode)<br>50% ± 10% (pulse mode)<br>20% ± 10% (pulse mode) |
| Pulse Repetition Rage | 100 Hz ± 20% |
| Ultrasonic Power | Variable from 1 watt to 20 watts. |
| Output Meter Accuracy | ± 20% (for any output above 10% of maximum) |
| Temporal Peak /Average Intensity Ratio | 2:1 ± 20% for 50% Duty Cycle<br>5:1 ± 20% for 20% Duty Cycle |
| Input Power Requirements: | 115 V/60 Hz, .8 Amp (Domestic)<br>230 V/50 Hz, .5 Amp (Export) |

## Output:

1. Continuous: 1 MHz signal that is on as long as the timer is running.
2. Pulse: 1 MHz signal modulated 100% by the 100 Hz rectangular wave with the selected Duty Cycle.

## Timer Accuracy:

1. Less than 0.5 seconds for settings less than 5 minutes
2. 10% for settings from 5 minutes to 10 minutes
3. 1 minute for settings greater than 10 minutes

## Applicator:

1. Effective radiating area: 8.5 $cm^2$ ± 1.5 $cm^2$
2. Maximum beam non-uniformity ratio: 6.0:1
3. Beam type: Collimating

When operated with 50 Hz power supply, the timer will run 16.67% slower. Table 1 can be used for a quick reference.

| TIMER Indicated Minutes | ACTUAL TIME Minutes | TIMER Indicated Minutes | ACTUAL TIME Minutes |
|---|---|---|---|
| 1 | 1 | 7 | 8 |
| 2 | 2 | 7.5 | 9 |
| 2.5 | 3 | 8 | 10 |
| 3.5 | 4 | 12.5 | 15 |
| 4 | 5 | 17 | 20 |
| 5 | 6 | 21 | 25 |
| 6 | 7 | 25 | 30 |

Note: These values have been rounded to the nearest half minute.

**Table 1**

# Physical Specifications

## Electrical:

| | |
|---|---|
| Required nominal voltage range: | 115 V or 230 V (selectable) |
| Required Frequency: | 50/60 Hz |
| Wattage Used: | 120 watts |
| Line Current: | .8 amps @ 115 V Line and .5 amps @ 230 V Line |

## Nominal Weight and Volume of Equipment Item without Reuseable Container:

| | |
|---|---|
| Weight: | 26 lbs |
| Cube: | 1.75 ft |
| Dimensions | 15" L x 23½" W x 9" H |

## Nominal Packed Shipping Weight and Volume of Each Shipping Container:

| | |
|---|---|
| Weight: | 33 lbs |
| Cube: | 4.99 ft |
| Dimensions | 21" L x 26¾" W x 15" H |

# Description of Ultrasonic Field

The spatial distribution of the radiated field is essentially a collimated beam of ultrasonic energy having a cross-sectional area of 8.5 $cm^2$ for the 10 $cm^2$ sound head when measured at a point 5 millimeters from the transducer face.

The energy distribution within the radiated field is 2.4 $w/cm^2$ maximum, and takes a generally conic shape having decreasing intensity at progressively increasing distance from the transducer face.

This field distribution applies for the radiation emitted into the equivalent of an infinite medium of distilled degassed water at 30 degrees C. and with line voltage variations in the range of ± 10% of the rated voltage.

## Abbreviations

The following abbreviations are used on the applicator head of the Intelect® 700-C™.

Area = Effective Radiating Area
Coll. = Collimating
BNR = Beam Non-Uniformity Ratio
Freq. = Frequency

## Plot of Ultrasonic Field Spatial Distribution 10 $cm^2$

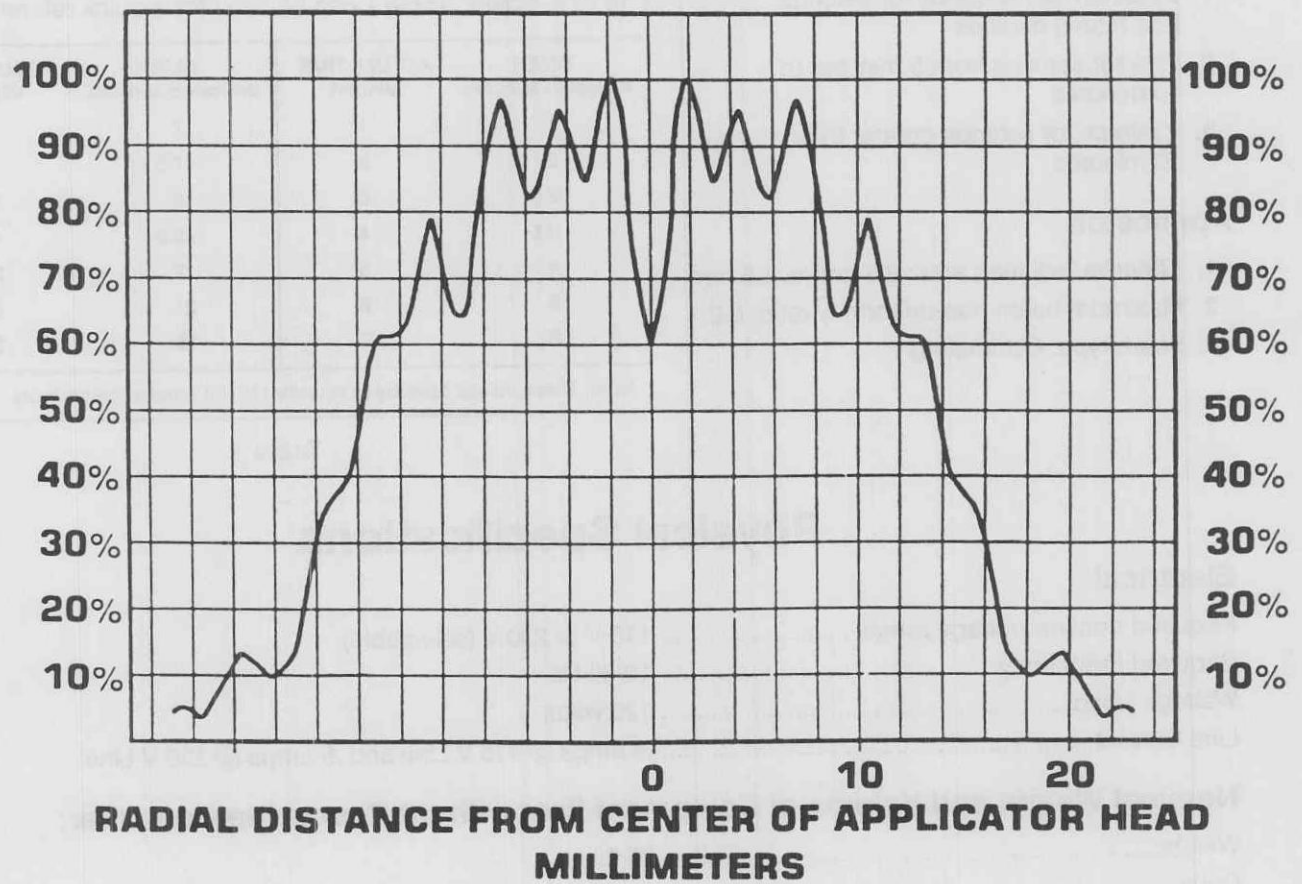


Figure 2

# High Voltage Specifications

Pulse Charge.....approximately 14 microcoulombs per twin peak.

Pulse Frequency .....One pulse per second to 120 pulses per second.

Output.....0 to 500 volts.

Output Current .....0 to 2500 milliamps peak

Average Current .....Approximately 1.5 milliamps at 120 pulses per second.

## Area of Conducting Surface of Electrodes

4-inch active electrodes.....3.75" dia. = 11.04 $in^2$ (7.125 $mm^2$)

3-inch active electrodes.....3.12" dia. = 7.64 $in^2$ (4,932 $mm^2$)

Dispersive electrodes .....7.5" x 9.5" = 71.25 $in^2$ (46,000 $mm^2$)

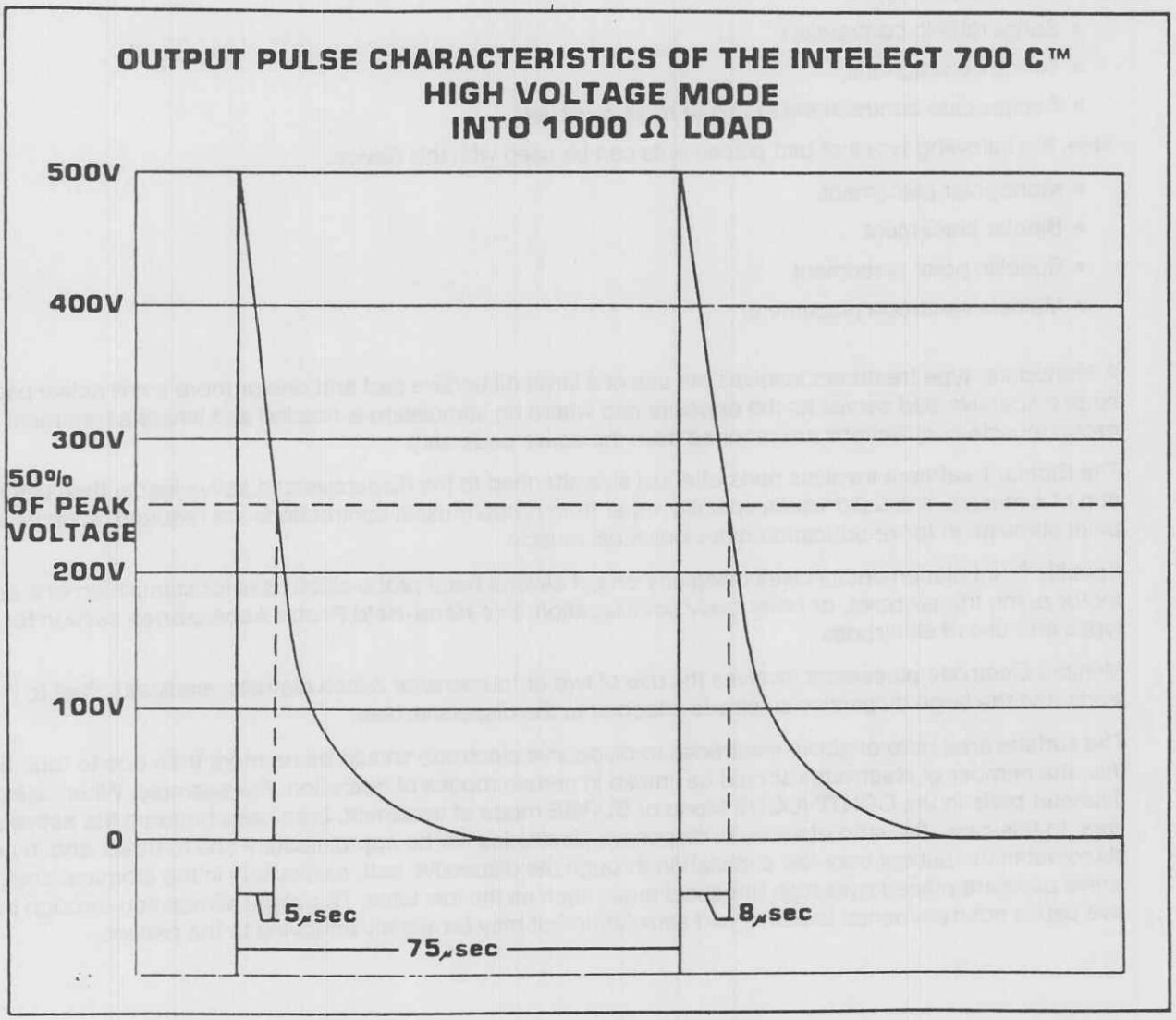


Figure 3

# Mode of Action for High Voltage Stimulation

Intelect® 700-C™ is designed to deliver a train of pulses of very short duration thereby causing muscle contractions through stimulation of the large motor fibers. By limiting the pulse duration of the stimulus, stinging and irritating effects are minimized at strong muscle contraction levels. By selecting the appropriate pulse rates and surge or reciprocate rates, muscles can be either twitched, tetanized, or surge tetanized at regular intervals. The proper selection of these parameters dictates the results obtained for various conditions.

The Intelect® 700-C™ unit comes with a selection of different size electrodes as well as a hand-held probe. The selection of the proper size electrode is an important parameter in the desired results and will be discussed in the operation section of this manual.

# General Operating Instructions for High Voltage Stimulation

In considering the various stimulation parameters, one must note that the following forms of muscle contractions are obtainable by this unit:

- Tetanic contraction.
- Surge tetanic contraction.
- Twitch contractions.
- Reciprocate contractions to two or more muscles.

Also, the following types of pad placements can be used with this device:

- Monopolar placement.
- Bipolar placement.
- Specific point placement.
- Multiple electrode placement.

A Monopolar type treatment involves the use of a large dispersive pad and one or more small active pads. The large dispersive pad serves as the opposite pad where no stimulation is needed and where a treatment effect and group muscle contractions are required from the active pads only.

The Bipolar treatment involves pads of equal size attached to the dispersive and active leads, then placed at each end of a muscle. It is used where specific rather than group muscle contractions are required, such as in motor point stimulation for re-education of an individual muscle.

Specific Point placement involves using any one of several hand probe electrodes for stimulation of a specific motor point, trigger point, or other body point location. See **Hand-Held Probe Accessories** section for details of types and use of electrodes.

Multiple Electrode placement involves the use of two or four smaller 3-inch diameter pads attached to the active leads and the large dispersive electrode attached to the dispersive lead.

The surface area ratio of active electrodes to dispersive electrode should be no more than one to four. Because of this, the number of electrodes should be limited in certain modes of operation. For example: When using two 4" diameter pads in the CONTINUOUS Mode or SURGE mode of treatment, both pads become the active surface area. In this case, the ratio of active to dispersive electrodes will be approximately one to three, and in certain pad placements the patient may feel stimulation through the dispersive pad, particularly in the stomach area, when the active pads are placed over high threshold areas such as the low back. This slight stimulation through the dispersive pad is not detrimental to active pad stimulation but may be slightly annoying to the patient.

# Control Panel Operation

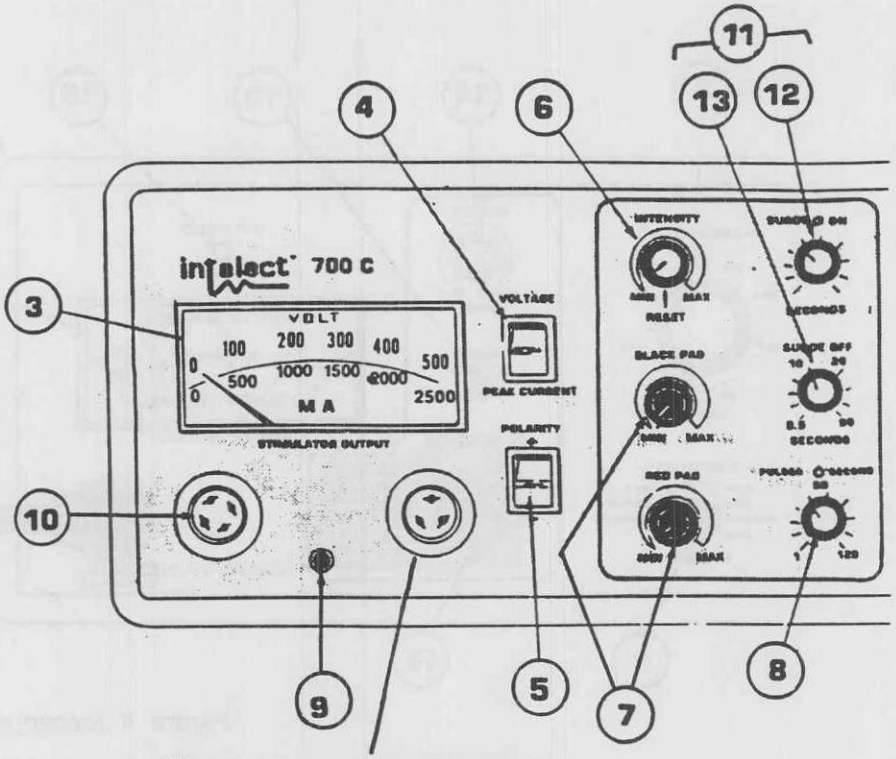


**Figure 4 Active Pad Jack**

1. **FUNCTION SELECTOR SWITCH:** This control knob selects the means of treatment either with a hand-held probe or with active electrode pads. When the knob is in the probe position the output is on continuously and the intensity is controlled remotely at the probe only.

   In CONTINUOUS, SURGE and RECIPROCATE positions the output is through the electrode pads and the intensity is controlled by the Intensity knob on the panel.

   In the CONTINUOUS position both pads or sets of pads are on continuously.

   In the SURGE mode both pads or sets of pads are cycled on and off together at rates selected by the SURGE ON and SURGE OFF controls.

   The RECIPROCATE mode of operation consists of three positions: 2.5, 5, or 10 seconds. These three positions determine the time that one of the two active electrodes is on while the other is off. At each 2.5, 5, or 10 seconds, as selected, the electrode pad that is on will switch off and the off pad will switch on. This alternate switching continues throughout the total treatment period as set on the timer.
2. **TREATMENT TIMER/POWER SWITCH:** This is a 0 – 29 minute rotary timer. When the timer is on and the FUNCTION selector is in the ULTRASOUND position, the green LED labeled ULTRASOUND ON will be lit. When Timer is in the off position, power to the generator is off. Refer to Table 1 on page 1–8 for Time Adjustments.
3. **STIMULATOR OUTPUT METER:** Intensities are indicated by the meter in either VOLTAGE mode or CURRENT mode. Voltage is read on the upper scale from 0 to 500 volts when selected and peak current is read on a lower scale 0 to 2500 milliamps when selected.
4. **METER SELECTION SWITCH:** This switch is used to select either voltage readout (in volts) or peak current readout (in milliamps).
5. **POLARITY SWITCH:** Positive (+) or negative (-) polarity of active electrode pads or probe is selected by this switch.
6. **INTENSITY/RESET CONTROL:** Any time the Function Switch is operated, i.e. SURGE to CONTINUOUS, the INTENSITY control must be reset by rotating counterclockwise until a click is heard (or felt) at the end of rotation. Output will remain at zero unless reset properly.
7. **PAD CONTROL:** Intensity of the applied voltage to the red or black pads can be adjusted independently. The adjustment can be set from MIN to MAX of the intensity indicated on the meter scale. For initial adjustment set intensity at MAX, adjust intensity at the main control knob; then adjust for maximum patient comfort.
8. **PULSES/SECONDS CONTROL:** Pulse rates of one pulse per second to maximum of 120 pulses per second are selected by this knob.
9. **DISPERSIVE PAD JACK:** Connect large dispersive pad at this connector.
10. **HAND-HELD PROBE JACK:** Connect hand-held probe to this connector.

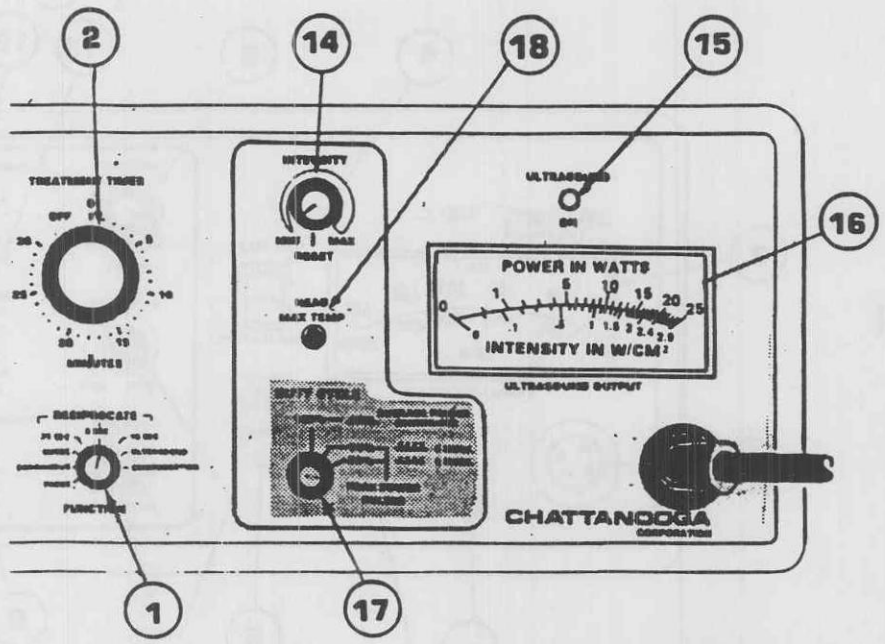


**Figure 4** *(continued)*

11. **SURGE MODE:** The independently timed SURGE ON and SURGE OFF functions allow for greater flexibility in application of high voltage stimulation. By setting the SURGE ON time to a longer or shorter period than the SURGE OFF, the user can achieve various degrees of muscle fatigue. **NOTE:** SURGE ON and SURGE OFF control knobs work only when the FUNCTION selector switch is in the SURGE position. The SURGE controls are inoperative when the FUNCTION selector switch is in the PROBE, CONTINUOUS and RECIPROCATE positions, 2.5, 5, and 10 seconds.
12. **SURGE ON:** Both electrode pads or set of pads are activated for a time as indicated around the knob from 0.5 seconds to 60 seconds. An automatic ramp up is included in the surge on time which is 1/3 of the time selected. Example: A surge time of 10 seconds on creates a 3.3 second ramp from 0 intensity to maximum intensity.
13. **SURGE OFF:** The rest period between surges is independently selected by this control with a range of times between 0.5 and 60 seconds.
14. **ULTRASOUND INTENSITY/RESET CONTROL:** Rotating this control knob clockwise increases the amount of ultrasound power being delivered. Anytime the function switch is operated, the intensity control must be reset.
15. **ULTRASOUND ON LED:** This Green LED is on when ultrasound power is being transmitted from the transducer (sound head).
16. **ULTRASOUND OUTPUT DISPLAY:** This display shows the amount of ultrasound power and intensity available at the transducer (sound head). The upper scale is calibrated in Watts and the lower scale in w/cm$^2$. In CONTINUOUS (100%) mode average power is displayed. In PULSED mode (50%, 20%) peak power is displayed.
17. **DUTY CYCLE SELECTOR:**

    **100% CONTINUOUS:** In this position the operator can select an ultrasound output that is a continuous sinusoidal waveform at a frequency of 1 MHz nominal.

    **50% PULSED:** In this position, the operator can select an ultrasound output of 1 MHz that is pulsed at 100 pulses per second. This produces rectangular pulses of 5 milliseconds duration, with an off time of 5 milliseconds between pulses.

    **20% PULSED:** In this position, the operator can select an ultrasound output of 1 MHz that is pulsed 100 pulses per second. This produces rectangular pulses of 2 milliseconds duration, with an off time of 8 milliseconds between pulses.

18 **HEAD MAX TEMP LED:** This Red LED comes on when the temperature of the ultrasound head (transducer) reaches approximately 140 degrees F. At the time the LED comes on, the unit will stop producing ultrasound, the ULTRASOUND ON LED will go out, and the TREATMENT TIMER will continue to run. When the transducer cools to approximately 120 degrees F, the Red LED will go off and the ultrasound power will be restored.

# Hand-Held Probe Application

The probe is a hand-held electrode, with a self-contained intensity control, designed for treating localized areas or for locating painful trigger point areas. The intensity control knob is built into the handle to provide the operator with intensity control at the treatment site. Intensity level is monitored on the panel meter.

The user should become familiar with the intensity control by turning the knob with the thumb and forefinger of the same hand that is holding the probe.

The probe comes with a disconnect mechanism on the shaft which allows for various electrodes to be used. The electrodes to be used can be secured by a thumbscrew. The electrodes are prevented from rotating about their axis by aligning the flat surface of the shaft so that it is perpendicular to the thumbscrew before twisting the screw clockwise to tighten.

## Accessories for Hand-Held Probe

The following are pictures and descriptions of the various electrodes that are available to be used with the Intelect® 700-C™ probe:

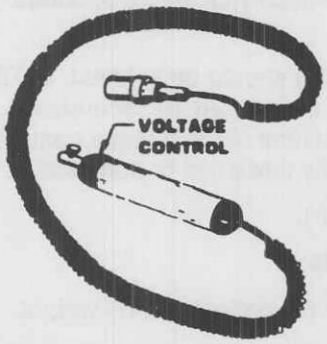


**Figure 5a: Hand-Held Probe**
Catalog No. 79001. Includes removable electrode connector.

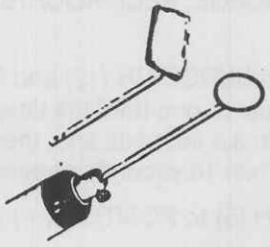

**Figure 5b: Small Spot Electrode**
Catalog No. 79005. 5/8" diameter disc used for locating motor and trigger points. Sponge cover Catalog No. 79059. Standard accessories included with unit.

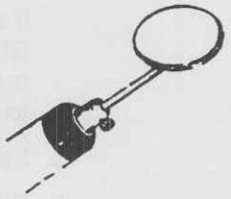

**Figure 5c: Large Spot Electrode**
Catalog No. 79006. 2" diameter disc with crowned edge for use with gel or lotion.

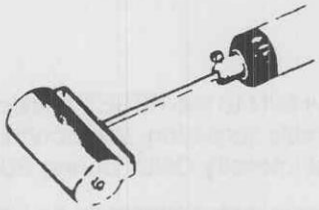

**Figure 5d: Small Roller Electrode**
Catalog No. 79003. Used for applying stimulation to muscles in a roll-on type massage action.

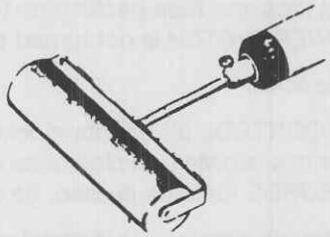

**Figure 5e: Large Roller Electrode**
Catalog No. 79004. Used for applying stimulation to muscles in a roll-on type massage action.

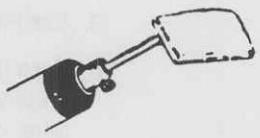

**Figure 5f: Rectangular Electrode**
Catalog No. 79008 and moist sponge cover Catalog No. 79062 are standard accessories included with unit.

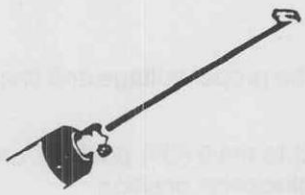

**Figure 5g: Insulated Shaft Electrode**
Catalog No. 79002. Small crowned 3/16" x 3/4" rectangular head with electrically insulated shaft.

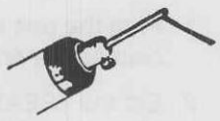

**Figure 5h: Acustim Electrode**
Catalog No. 79007. Used for very accurate selection and stimulation of points on the body.

# Operating Procedure

This section is divided into three sections; HIGH VOLTAGE, ULTRASOUND and COMBINATION.

## 1. High Voltage Operation

The controls for this mode are located on the left side of the front panel.

1. Plug the unit into a properly grounded outlet of the proper voltage and line frequency. Refer to the Nameplate on the rear of the unit.
2. Plug active lead into the 3-terminal receptacle. Plug dispersive lead into the banana receptacle. Also, plug the hand-held probe into the 4-terminal receptacle. These receptacles are located on the front of the unit. These connectors will not mate incorrectly.
3. The plugs located at the ends of the two active leads should be plugged into the 3-inch or 4-inch active electrodes. The other end of the dispersive lead should be plugged into the large dispersive electrode. The receptacle is located in the end of the black conducting surface.
4. Dial the FUNCTION SELECTOR SWITCH (1) in the center of the panel to the desired setting: Either PROBE, CONTINUOUS, SURGE, RECIPROCATE 2.5 seconds, RECIPROCATE 5 seconds, or RECIPROCATE 10 seconds.

   If selection is SURGE, then SURGE ON (12) and SURGE OFF (13) should be set next. **NOTE:** The SURGE ON has a built-in ramp equal to one-third the time setting of the on time. At 10 seconds the intensity will build from 0 to maximum in 3.3 seconds and, therefore, the total time of the muscle contraction from start to release may be longer than 10 seconds depending on intensity threshold of contraction.
5. Set the POLARITY SWITCH (5) to POSITIVE (+) or NEGATIVE (-).
6. Dial the PULSES/SECONDS CONTROL (8) to the determined rate.
7. Attach the dispersive pad to the patient, using Nylatex straps or the patient's body weight.

   Attach the active pad or pads to the patient unless you are going to use the probe with its attachments. If you are using the roller electrodes, use a conductive gel on the area of the patient where high voltage is going to be used.
8. Turn TREATMENT TIMER/POWER SWITCH (2) to the determined total time of the treatment by turning the knob beyond the desired time and then backing up to the desired time. Intensity will remain at zero if TREATMENT TIMER/POWER SWITCH is not turned on.
9. Set PAD CONTROL (7) to MAX.
10. Turn INTENSITY/RESET CONTROL (6) counterclockwise to below MIN to the RESET position where a click will take place. After this, slowly turn clockwise until patient feels sensation, and continue to desired level of tolerance. If the SURGE function is used, be sure to adjust intensity ONLY during SURGE ON time.
11. If patient has more sensory perception of electrical stimulation in one active electrode pad or pads over the others, or if a stronger muscle contraction occurs under one electrode pad or pads and not the other, then the PAD CONTROL can be used to readjust relative strengths. The active pads are color coded for easy identification. The PAD CONTROL will adjust the relative intensity of each pad individually.
12. When the treatment is complete, remove pads or pad and return probe (if used) to its holder and return intensity control to reset.

## 2. Ultrasound Operation

1. Plug the unit into a properly grounded outlet of the proper voltage and line frequency. Refer to the Nameplate on the rear of the unit.
2. Set the TREATMENT TIMER/POWER SWITCH (2) to the 0 (Off) position, and the ULTRASOUND INTENSITY/RESET CONTROL (14) to the fully counterclockwise position.
3. Set the FUNCTION SELECTOR SWITCH (1) to the ULTRASOUND POSITION.
4. At this point, you may begin the treatment by applying Intelect Ultrasound Gel to the area of the patient to be treated.

5. Turn the TREATMENT TIMER/POWER SWITCH (2) to the desired treatment time by turning the knob beyond the desired time and then backing up to the desired time.
6. Select the operating mode by rotating the mode switch (17) to the desired duty cycle (PULSED: 20% to 50% or CONTINUOUS: 100%).
7. You should then place the applicator in contact with the patient's body with a firm uniform pressure. You must keep the applicator moving during the treatment. Failure to keep the applicator moving may result in hazardous exposure to the ultrasound energy.
8. Adjust the Ultrasound Output by turning the ULTRASOUND INTENSITY/RESET CONTROl (14) until you reach the desired output on the meter (16). Use the Upper scale for Watts and Lower scale for w/cm$^2$.
9. If you need to interrupt the treatment for any reason, turn the TREATMENT TIMER/POWER SWITCH (2) to the off position (Bell will ring). To resume treatment repeat steps 4-8.
10. At the end of the treatment, the bell will sound and the unit will shut off.

## 3. Combination Operation

1. Set the FUNCTION SELECTOR SWITCH (1) to the COMBINATION position.
2. Attach the dispersive pad to the patient.
3. Set the POLARITY SWITCH (5) to POSITIVE (+) or NEGATIVE (-).
4. Dial the PULSES/SECONDS CONTROL (8) to the determined rate.
5. Turn PAD CONTROL (7) to 100% position.
6. Select desired mode of ultrasound output – PULSED ultrasound in the 20% or 50% DUTY CYCLE (17) position, or CONTINUOUS ultrasound in the 100% DUTY CYCLE position of the selector switch.
7. Turn TREATMENT TIMER/POWER SWITCH (2) to the desired time by turning the knob beyond the desired time and then backing up to the desired time.
8. Begin normal treatment by applying Intelect Ultrasound Gel to the treatment area of patient's body. Contact the applicator to the patient's body with firm, uniform pressure. Adjust the desired treatment Intensities; first the ULTRASOUND and then the HIGH VOLTAGE, while continuously moving the applicator over the affected area. Do not maintain the applicator stationary over any given area for extended periods. This may result in hazardous exposure to ultrasonic energy.

   **CAUTION:** It is possible that high voltage stimulation may have significant pain reduction effect, to the point where the patient may have no appreciable response to an over-dosage condition of the ultrasound energy. Therefore, it is suggested to apply the ultrasound first, then the stimulation.
9. Continue procedure described in Step 8 above for duration of treatment time. Insure adequate coupling by adding sufficient gel as required. Inadequate coupling is apparent by noting variations in the intensity meter indication while moving the applicator.
10. When treatment is complete, return setting of Intensity controls to Reset, then store applicator in the holder.

# SECTION 2

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# Maintenance and Service Instructions

1. To fully maintain compliance with Federal Regulation Title 21 (21 CFR) this unit must be recalibrated annually. It is recommended that all *Chattanooga Group, Inc. Ultrasound Products* be returned to the factory or an authorized servicing dealer for repairs or recalibrations. It is also recommended after the replacement or repair of any major component. (See section for **Calibration Procedures**.)

2. The following items should be checked at least monthly to insure proper operations of this unit:
   A. Power cord and plug. Check to make sure the cord is not frayed, kinked or has torn or cut insulation.
   B. Transducer (applicator) Cable. Check to make sure the cable is flexible, free of kinks, not frayed and that insulation is intact.
   C. Transducer (applicator) Face. Check to see that there is no build-up of gel or foreign material on the stainless steel face.
   D. LED's. Check each function to see if the LED is on when you are using that function.

# Trouble Shooting

**CAUTION:** There is an electrical shock hazard present with cover removed. Refer servicing to a Qualified Service Technician.

The following problems and solutions are presented to assist you in solving some of the problems that could possibly happen to your Intelect® 700-C™.

| PROBLEM | POSSIBLE MALFUNCTION | REMEDY |
|---|---|---|
| No Power to unit. | Unit not plugged in.<br>No power to the receptacle. | Plug in unit.<br>Check for tripped circuit breaker or blown fuse on the facility circuit. |
| Unit has power but no Ultrasound output. | Internal fuse blown.<br>Loose connection inside unit. | Check 3/8 amp (2) & 1/8 amp (2) fuses. Check the 3 amp and 1/2 amp picofuses on the power supply board. This should be done only by a Qualified Service Tech.<br>Check internal connections for proper seating of plugs in receptacles and for broken wires. |
| U.S. output meter only indicated about half-scale or less when Intensity is set at maximum. | Applicator cable loose.<br>Applicator cable broken.<br>Oscillator detuned.<br>Crystal damaged. | Replug cable into the shield box.<br>Replace applicator only with the same type of applicator.<br>Recalibrate.<br>Replace transducer head in the applicator and recalibrate. |
| When unit is energized Head Max. Temp LED (red) lights and beeper sounds. | Shorted applicator cable.<br>Water in applicator head. | Check the cable with an ohmmeter. If the cable is shorted, replace the cable with the same type.<br>Remove the transducer head and dry out the inside of the applicator. If the O-ring is defective, replace it. Consult the factory. |
| Timer will not set. | Timer knob loose. | Remove cap on the knob and tighten the collet. Rotate the timer fully clockwise and then loosen the collet so that the knob is free. Align the white line of the knob with the 29 MIN. mark on the timer scale and re-tighten the knob collet. Perform section 4 of calibration procedure. |

**Table 2a**

| PROBLEM | POSSIBLE MALFUNCTION | REMEDY |
|---|---|---|
| No stimulation out of both electrode pads. | Intensity control has not been reset after Function selector was changed. Also Intensity must be reset after timer has timed out or each time unit started. | Operate reset switch. |
| | Dispersive wire is broken. | Replace dispersive lead. |
| | Both wires to active electrode pads broken. | Replace active lead. |
| | Malfunction on circuit board. | Replace circuit board. |
| | Internal fuse blown. | Check 3/8 (2) & 1/8 amp (2) fuses. |
| No stimulation out of one pad. | Broken wire. | Replace. |
| | Pad control at minimum. | Check control setting. |
| | Poor patient contact. | Check for ample coupling medium |
| Too much stimulation out of dispersive pad. | Small area only 8" x 10" black surface is conducting stimulation. | Move dispersive pad on patient so that the entire surface is in contact with patient (back, abdomen or thigh). |
| | Dirty dispersive pad. | Clean with soap and water or replace pad. |
| | Too much active pad surface. | Use smaller active electrodes; or use one-half the number of electrodes; or use unit on Reciprocate instead of Continuous or Surge. |
| No stimulation out of hand-held probe. | Dispersive pad is not on patient. | Place dispersive pad on patient. |
| | Dispersive wire is broken. | Repair or replace. |
| | Dry sponge on probe electrode. | Moisten sponge. |
| | Probe is defective. | Repair or replace. |
| | Voltage control on probe is turned down. | Adjust voltage control on probe. |
| Treatment timer malfunction. | Timer broken internally. | Replace timer. |
| No meter readout. | Intensity control not reset. | Reset, then continue. |
| | Broken wire to meter. | Resolder wire. |
| | Malfunction of circuit board. | Replace circuit board or return to factory for repair. |
| | Treatment timer not on. | Turn on timer. |
| | Broken meter. | Replace meter. |
| Yellow Pad Indicator lamps do not light. | Defective lamp. | Replace lamp. |
| Improper meter readings in voltage or peak current. | Defective circuitry on P.C. board. | Replace circuit board or return unit to factory for repair. |

**Table 2b**

# Ultrasonic Generator Calibration

**CAUTION:** An electrical shock hazard is present during several portions of the calibration procedure. Calibration should be performed by a Qualified Service Technician.

## 1. Test Equipment Required

A. Power line monitor (expanded scale voltmeter for rated line voltage ± 10%), VIZ model WV-120B or equivalent for 115 VAC line.

B. Autotransformer, adjustable from 90% to 110% of rated line voltage, 150 watts or greater.

C. Ultrasound Power Meter, Ohmic Instruments Model UPM-30 or equivalent.

D. Oscilloscope, Hameg Hm 204-2 or equivalent.

E. Probe, voltage, X10, Scope, low capacitance.

F. Probe, current, Textronix P6021 AC current probe or equivalent.

G. Voltmeter, Digital, 3½ digits, Simpson Model 461 or equivalent.

H. Probe, temperature, Fluke Model 80T-150 or equivalent.

I. Source of approximately ½ gallon of distilled de-oxygenated (<5 PPM) water at 30 degrees Celsius for use in UPM-30 power meter (item 3 – "Test Setup").

J. Counter, frequency, 10 MHz, Triplet 7000 or equivalent.

K. Stopwatch, Silconix Model 705 or equivalent.

L. Applicator current transformer adapter (see Figure 6).

## 2. Instrument Preparation

A. Remove the top cover of the unit by removing the six #6 truss head screws (three on each side) and lift the cover off the cabinet.

B. Remove five #6 truss head screws on back panel. The back panel can now be tilted outward for inserting current probe adaptor.

C. Insert an RF current probe adaptor between the ultrasound applicator cable and the RF phono receptacle on the shield box located on the rear panel. The adaptor construction is shown in Figure 6.

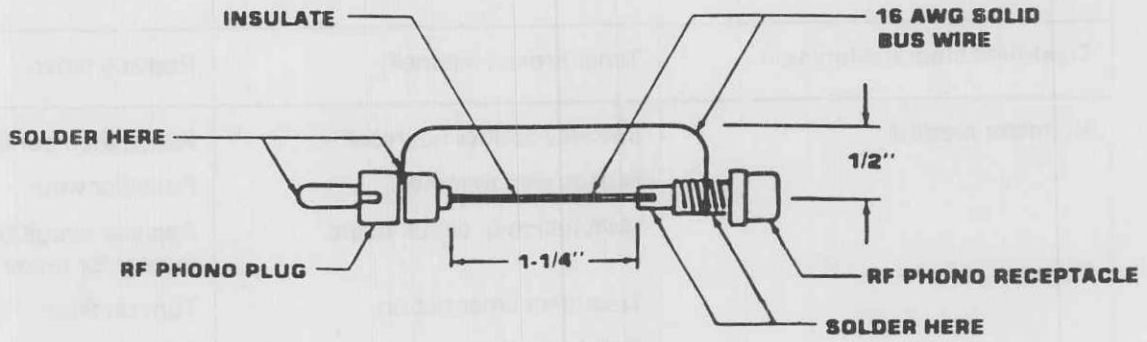



Figure 6

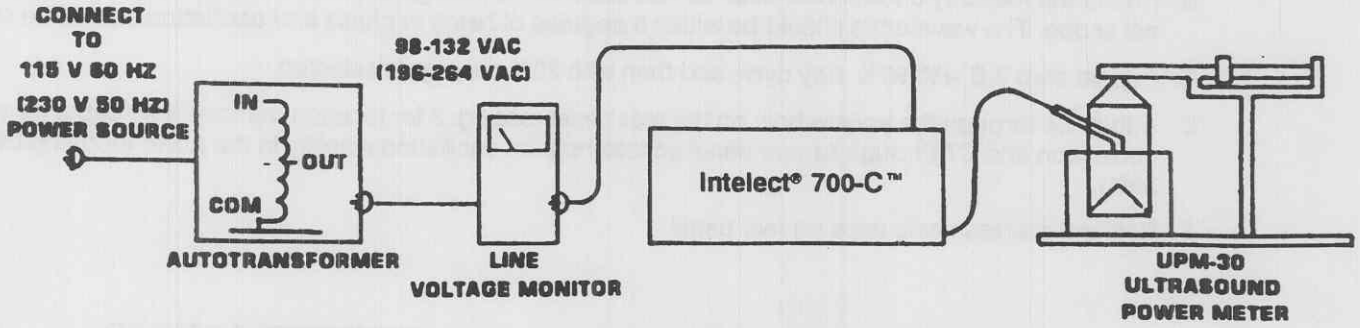



**Figure 7**

### 3. Test Setup

A. Connect the test setup as shown in Figure 7.

C. Set AC input voltage with the autotransformer to 115 (230) VAC line monitor.

D. See OHMIC Instructions clinical Engineering notes AN-330 for operation of the UPM-30 US. Power Meter.

### 4. Timer Test and Adjustment

A. Using a stopwatch, check the accuracy of the timer with time settings of 1 min., 5 min., 10 min., 20 min., and 29 min. See specifications in Section 1 page 1–8 for required timer accuracy.

B. If the timer accuracy is out of specification, rotate the timer knob fully clockwise and adjust the collet on the knob so that the white line on the knob is aligned with the 29 minute mark on the timer scale.

C. Repeat steps 4.A and check also that the white line on the knob is aligned with the "0" position in the scale after the timer times out.

### 5. Check Power Supply

A. Rotate Intensity knob fully counterclockwise and the timer to its fully clockwise position.

B. Connect the DC digital voltmeter to the pins 1 (+) and 2 (-) on connector J1 which connects to the control board and measure the 12 VDC output. It should be between 11.5 VDC and 12.5 VDC.

### 6. Adjust the Duty Cycle and Check Pulse Frequency

A. Select 20% Duty Cycle and connect the oscilloscope voltage probe to pin #3 (signal) and ground clip to pin #2 (com.).

B. Adjust the time base of the oscilloscope to 1 msec/div and measure the period of the 100 Hz signal. It should be between 8 and 12 msec.

C. Adjust the scope time base for 10 divisions of one cycle of the signal. On the control board, adjust R5 for a pulse width of 7.9 divisions.

D. Select 50% Duty Cycle and adjust R4 on the control board for a pulse width of 4.7 divisions.

E. Select 100% Duty Cycle and observe that the signal is a DC level less than .5V.

**7. Check and Adjust the RF Oscillator**

A. Connect the scope current probe around the center conductor of the current probe adaptor and connect the voltage probe to the outside conductor.

B. Rotate the Intensity control clockwise as you observe the voltage and current waveforms on the dual channel scope. The waveforms should be within 5 degrees of being in phase and oscillation should be stable.

C. Repeat step 7-B with 50% duty cycle and then with 20% duty cycle selected.

D. Adjust C4 through the access hole on the rear panel (see fig. 3 for location, remove hole caps) for phase correction and C7 through its rear panel access hole for oscillation stability in the pulse modes (20% and 50%).

E. Replace stainless hole caps on rear panel.

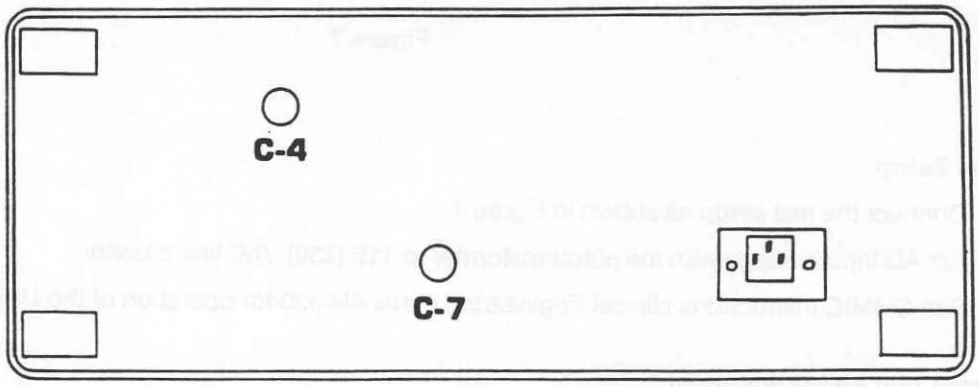



**Figure 8**

**8. Check and Adjust Modulated RF Duty Cycle**

A. Select 20% Duty Cycle and observe the duty cycle of the 100 Hz modulated RF waveform. Readjust R5 as necessary to obtain 21% duty cycle.

B. Select 50% Duty Cycle and again observe the modulated RF waveform. Readjust R4 as necessary to obtain 53% duty cycle.

**9. Output Meter Calibration**

A. With electrical power removed, adjust the mechanical zero adjustment, located on the front panel under the meter, to align the meter pointer with "0" on the meter dial.

B. Reapply electrical power to the unit and select 100% duty cycle.

C. Adjust the Intensity control on the front panel to obtain 20 watts output power on the UPM-30.

D. Adjust the meter calibration potentiometer, R18, for an indication of 20 watts on the front panel output meter.

E. Check the accuracy of the output meter by comparing its indication to the power indicated on the UPM-30 at the power levels listed below.

| U.S. Meter | UPM-30 Indication | |
|---|---|---|
| | Minimum | Maximum |
| 2.0 W | 1.72 W | 2.28 W |
| 5.0 W | 4.3 W | 5.7 W |
| 10.0 W | 8.6 W | 11.4 W |
| 15.0 W | 12.9 W | 17.1 W |
| 20.0 W | 17.2 W | 22.8 W |

F. Vary the line voltage from 98 VAC (196 VAC) to 132 VAC (264 VAC) and check that the output power remains within the limits listed above.

G. Select 50% Duty Cycle and check the peak output meter accuracy by comparing its indication to the average power indication on the UPM-30 listed below.

**POWER = (% DUTY CYCLE) (POWER PEAK)**

| U.S. Meter Peak Power | UPM-30 Indication Average Power | |
|---|---|---|
| | Minimum | Maximum |
| 2.0 W | .86 W | 1.14 W |
| 5.0 W | 2.15 W | 2.85 W |
| 10.0 W | 4.3 W | 5.7 W |
| 15.0 W | 6.5 W | 8.5 W |
| 20.0 W | 8.6 W | 11.4 W |

H. Select 20% Duty Cycle and check the accuracy of the output meter by comparing its indication to the UPM-30 indications as listed below.

| U.S. Meter Peak Power | UPM-30 Indication Average Power | |
|---|---|---|
| | Minimum | Maximum |
| 2.0 W | .34 W | .46 W |
| 5.0 W | .86 W | 1.14 W |
| 10.0 W | 1.72 W | 2.28 W |
| 15.0 W | 2.58 W | 3.42 W |
| 20.0 W | 3.44 W | 4.56 W |

**10. Check Head Maximum Temp Trip**

A. Apply maximum power at 100% duty cycle to the ultrasound applicator with it coupled to the air.

B. Allow the applicator to heat until the Head Maximum Temp LED lights, the beeper sounds and the ultrasound energy is removed from the head (the output meter indication will go to zero).

C. After the head cools, power will be reapplied to the head (LED goes off and meter indication returns to maximum).

D. Let the Head Maximum Temp control cycle on and off 3 times and then, with the temperature probe, check the surface temperature of the stainless steel head immediately after the Head Maximum Temp LED lights. The temperature must be between 130 degrees F. and 150 degrees F.

# High Voltage Calibration

## Equipment needed:

1. Oscilloscope: 10 MHz or greater bandwidth with 10:1 probe.
2. Frequency Counter with period function (1 sec.) and time interval function (10 sec.); i.e., Simpson 2725.
3. Digital Voltmeter (DVM).
4. Stop Watch.
5. Surge On and Off indicator.

## Precalibration setup

Adjust the following controls to the designated positions listed below before applying power to the unit under test:

**Front Panel Controls**

| | | |
|---|---|---|
| R118 | Pulse Rate Control | 60 pps |
| S7 | Surge On Control | 5 sec. |
| S8 | Surge Off Control | 5 sec. |
| R121 | Intensity Control | Reset |
| S6 | Treatment Timer | Zero |
| S5 | Power Switch | Off |
| S2 | Function Switch | Continuous |
| S3 | Meter Selector | N/A |
| S4 | Polarity Switch | Positive |
| | Pad Control (Front Panel) | CW (100%) |

## Calibration

1. **Power Supply Voltage Adjustment**

   Set DVM on 20 VDC range. Attach negative led of meter to circuit common (negative side of C34) and positive lead to +15 volts supply (Anode of D13). Connect the Intelect® 700-C™ and turn the Treatment Timer on. The DVM should read 15 volts ± .02 volts. Adjust R90 clockwise until DVM reads 15.00 volts ± .02 volts. Move positive lead of DVM to pin 14 of IC26 and check reference voltage. It should be 10 volts ± .4 volts.

2. **Meter Voltage Adjustment**

   Set Meter Selector in Volts position. Adjust mechanical zero of meter with intensity at zero. Turn Intensity Control full clockwise. Adjust R70 until meter reads 500 volts. Also check collector of Q16 (Heat Sink) or emitter of Q17 with DVM. As intensity varies from 0 to 500 volts, this point should vary from 0 to 15 volts ± 1 volt.

   Return Intensity control to reset position. NOTE: When Intensity control is CCW, knob should point to reset.

3. **Reciprocate Time Adjustment**

   Set frequency counter on 1 KHz range. Attach common lead to circuit common (negative side of C34) and attach other lead to TP1 (pin 3 of IC13). Adjust R46 until frequency counter reads 819 Hz ± 20 Hz. NOTE: This signal is a 15 volt peak-peak rectangular waveform with approximately 50% duty cycle.

4. **Pulse Rate Adjustment**

   Set knob on shaft so that when control is CCW the pointer on the knob will point below 1 pps. Connect frequency counter to pin 3 of IC2 (or cathode of D1). Turn Pulse Rate control to 120 pps. (Set pointer exactly on 120 pps.) Adjust R1 until frequency counter reads 120 Hz. Put frequency counter in period mode. Turn Pulse Rate control CCW gradually. The period will increase as the control is rotated CCW until you reach the end of the electrical rotation, where the control will rotate further but the period will not increase. Then rotate the control slowly CW until the period just starts to decrease. Without changing the position of the shaft, set the pointer on the knob at exactly 1 pps on the dial and tighten the knob on the shaft. Set Pulse Rate control again in 120 pps position and adjust R1 for 120 Hz on counter. Return counter to period function and set Pulse Rate control to 1 pps and adjust R2 for a period of 1.00 seconds. Repeat 120 pps and 1 pps adjustments one more time, as there is a slight interaction between these adjustments. Also check that the Pulse LED is operating.

5. **Output Voltage Adjustment**

   Set Pulse Rate control at 80 pps. Attach oscilloscope ground and 10:1 probe. Turn intensity control fully CW (500 volts). Adjust R14 for 500 volts peak output. Check the waveshape of the double pulse and the 75 usec spacing between pulses. NOTE: Make sure that the oscilloscope probes are calibrated before this step.

6. **Current Meter Calibration**

   Disconnect scope probe. Put Meter Selector switch in peak current readout mode. Adjust R97 (Current Zero Adjust) for zero reading on meter. Make sure that intensity is at zero volts when adjusting zero. Turn Intensity control up to 500 volts and place 500 ohm 1% resistor across Intelect output. then adjust R104 for a 1000 ma reading on meter. Turn intensity to zero.

7. **Surge Calibration**

   The surge circuit consists of two parts. The first part is a function generator which generates the complex surge waveform and will be abbreviated **S**urge **F**unction **G**enerator (SFG). The second part is a modulator which causes the DC intensity level to change at the same rate as the surge function. This modulator will be abbreviated as the **S**urge **M**odulator (SM). The SFG consists of Q3, 4, 5, 6, 8; IC7, 8, 10, 11, 12 and Q24. The SM consists of Q7; IC18, 32.

   The SFG will be calibrated first. Place unit in Surge mode. R18 calibrates the Surge On time. Set Surge On time to 10 seconds and Surge Off time to 1 second. Attach time interval counter to TP2 and with counter on 10 seconds range and adjust R18 until counter reads 10.0 ± 0.1 seconds. Check 1 second time with the counter ± 5%. Then set Surge Off time to 10 seconds and Surge On time to 1 second. Attach time interval counter to TP3 and with counter on 10 seconds range and adjust R20 to calibrate the Surge Off time to 10.0 ± .01. Check 1 second time with the counter ± %. Then attach the Surge On and Off indicator to the unit under test and check the 60 second Surge On and Surge Off times with the stopwatch.

   The surge function zero is adjusted by R27. Attach positive lead of DVM to the base of Q7 or pin 8 of IC7 and the negative lead to the negative side of C34. Set Surge Off time to 10 seconds and Surge On control to 1 second. Then during the time when the Surge Off LED is on, adjust R27 until DVM just reads a null (less than 0.1 volt). Do not adjust R27 past this point as it will cause an error in calibration.

   The SM is the second part of the Surge Calibration. Measure with the DVM the voltage at pin 7 of IC26 when the Intensity control is set at 500 volts. Record that voltage. Then attach DVM to pin 6 of IC32. Turn Intensity to zero and adjust R68 (Surge Modulator Zero Adjust) for a zero reading on DVM. Then turn Intensity control to 500 volts, Surge On to 10 seconds and Surge Off to 0.5 seconds. During Surge On time as indicated by the Surge On and Off indicator (at maximum voltage of ramp), adjust R32 (Surge Modulator Drive) until pin 6 of IC32 is the same as the voltage previously recorded at pin 7 of IC26.

This completes the adjustment phase of the calibration. Make the following Functional checks:

1. **Probe Mode**

   Place the unit into the Probe Mode. Check to see that the Probe Intensity control varies the voltage on the intensity meter and the output from zero to 500 volts. Check the operation of the Polarity Switch. With a 500 ohm load, check the operation of the current meter in the probe mode.

2. **Continuous Mode**

   Red and black pad LED's should be lighted. Check power-on-clear function. Check to see that intensity varies from zero to 500 volts. Check operation of current meter on the red and black pads with the 500 ohm load. Check operation of pad controls. Intensity control should be set at maximum.

3. **Surge Mode**

   Red and black pad LED's should be lighted. Check power-on-clear function. Check to see that intensity varies from zero to 500 volts. Check operation of current meter on the red and black pads with the 500 ohm load.

4. **Reciprocate Mode: 2.5, 5 and 10 Seconds**

   Visually check period of 2.5, 5 and 10 second reciprocate periods. Red and black pad LED's should light alternately starting with the red pad LED.

5. **Reset**

   Check to see that reset operates properly between all modes except while in reciprocate modes.

6. **Timer Check**

   Check Timer operation to make sure that it will shut off at time out.

# Calibration Check List

| Steps | Initial |
|---|---|
| 1. Power Supply Voltage Adjustment: 15.00 volts ± .02 volts. | _____ |
| Reference Voltage Check: 9.6 to 10.4 volts. | _____ |
| 2. Meter Voltage Adjustment. | _____ |
| Collector of Q16: Check 0 to 15 ± 1 volt. | _____ |
| 3. Reciprocate Time Adjustment: 819 Hz ± 20 Hz. | _____ |
| 4. Pulse Rate Calibrate: 120 pps. | _____ |
| 1 pps. | _____ |
| Pulse Indicator LED. | _____ |
| 5. Output Voltage Adjustment: 500 volts peak. | _____ |
| Check Waveform of Output and 75 usec spacing of pulses. | _____ |
| 6. Current Meter Calibration: Zero | _____ |
| 1000 mA | _____ |
| 7. Surge Function Generator: On Time | _____ |
| Off Time | _____ |
| Surge Function Zero | _____ |
| Surge Modulator Zero | _____ |
| Drive | _____ |

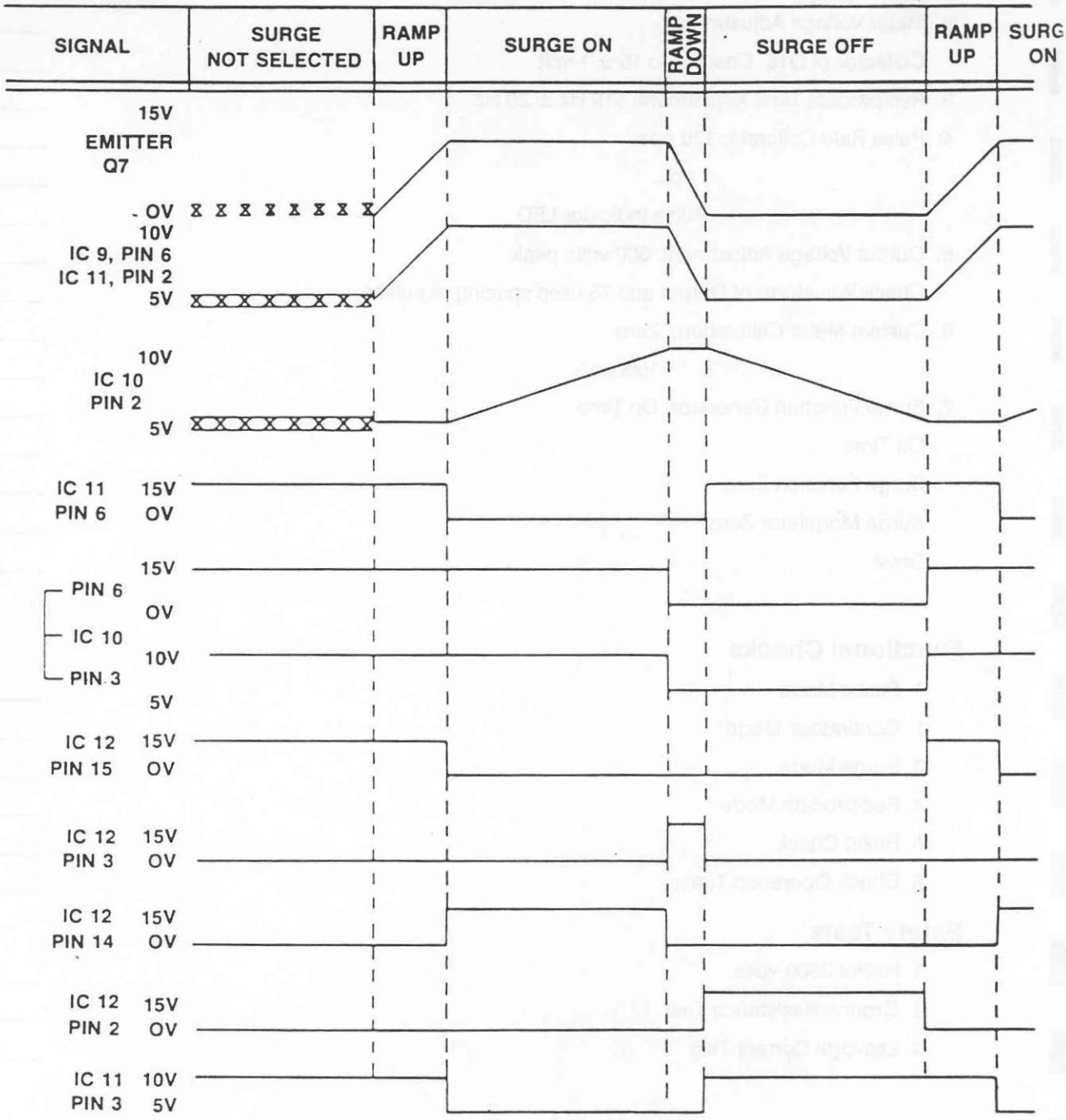
## Functional Checks

| | |
|---|---|
| 1. Probe Mode | _____ |
| 2. Continuous Mode | _____ |
| 3. Surge Mode | _____ |
| 4. Reciprocate Mode | _____ |
| 5. Reset Check | _____ |
| 5. Check Operation Timer | _____ |

## Safety Tests

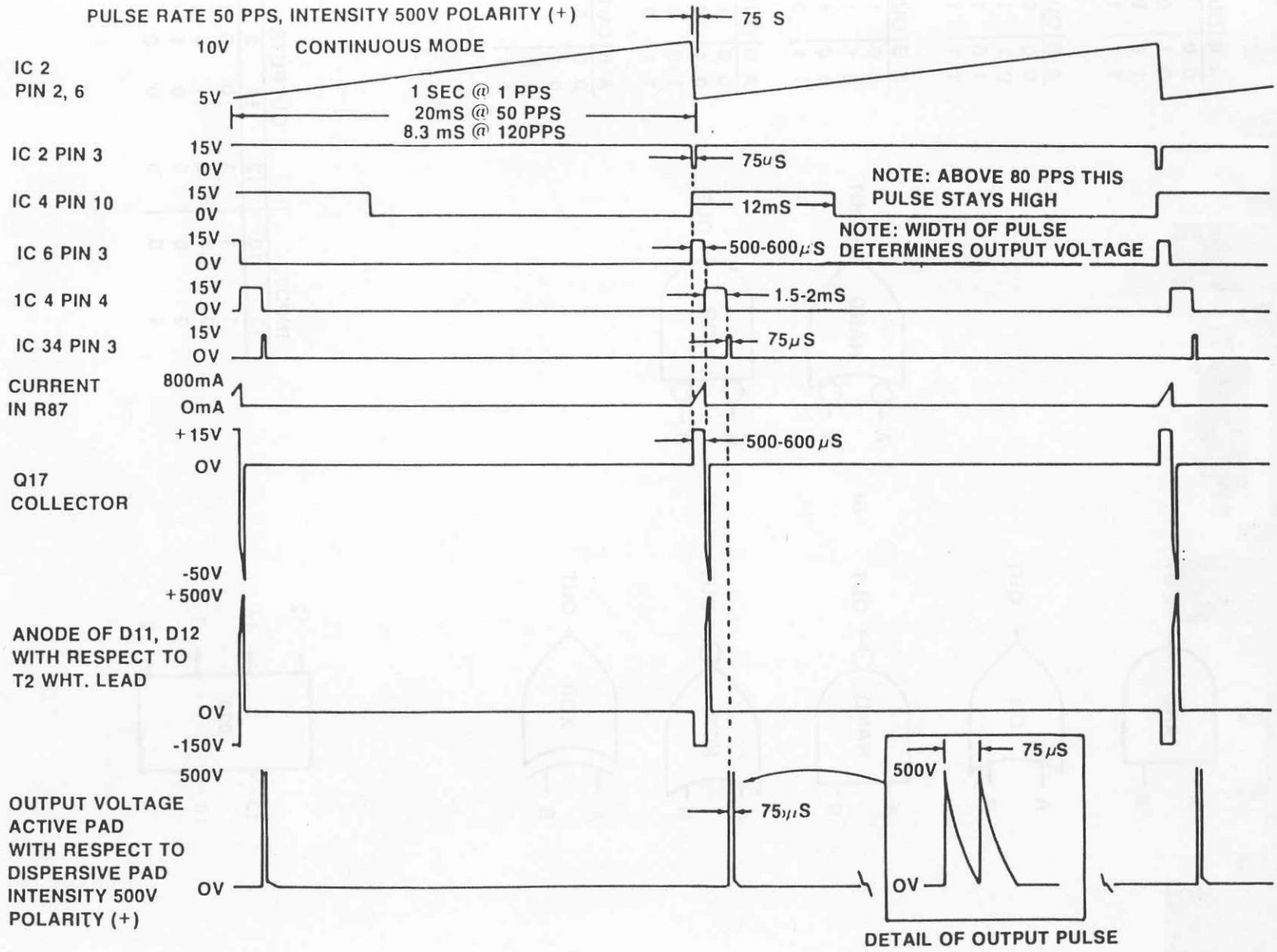
| | |
|---|---|
| 1. Hi-Pot 2500 volts | _____ |
| 2. Ground Resistance Test | _____ |
| 3. Leakage Current Test | _____ |

# Timing Diagram for Surge Circuit



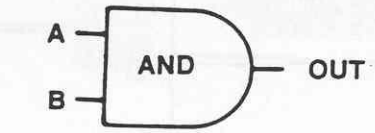

Schematic 1

# Timing Diagram for Pulse Generation Circuit

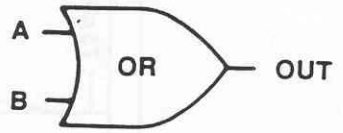



Schematic 2

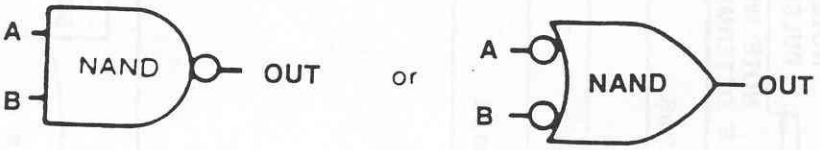
# Truth Tables for Logic used in Intelect® 700-C™



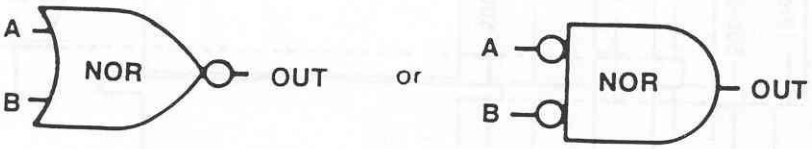

| A | B | OUT |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |



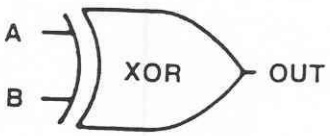

| A | B | OUT |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |



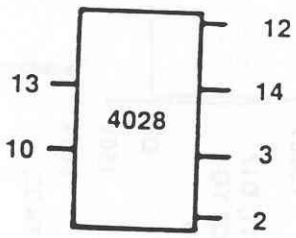

| A | B | OUT |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | ,0 |




| A | B | OUT |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 0 |



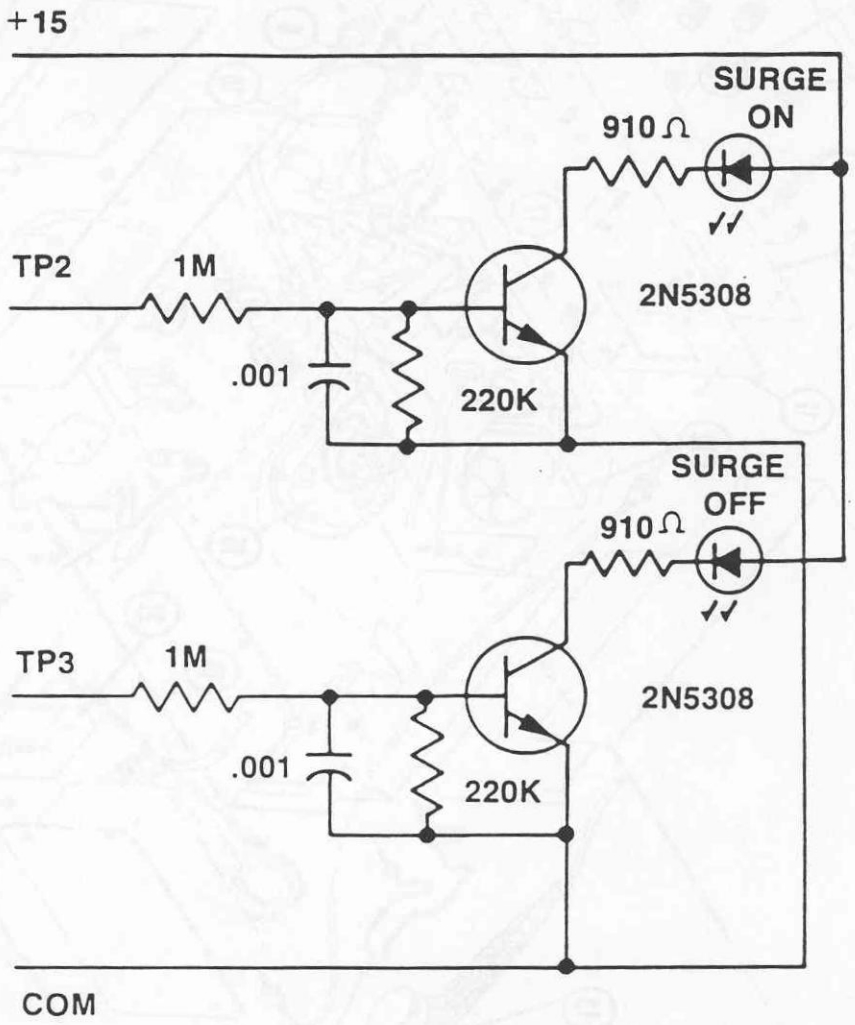

| A | B | OUT |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |




| INPUTS | | OUTPUTS | | | |
|---|---|---|---|---|---|
| 13 | 10 | 12 | 14 | 3 | 2 |
| 1 | 1 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 0 | 0 |
| 0 | 0 | 0 | 0 | 1 | 0 |
| 1 | 0 | 0 | 0 | 0 | 1 |

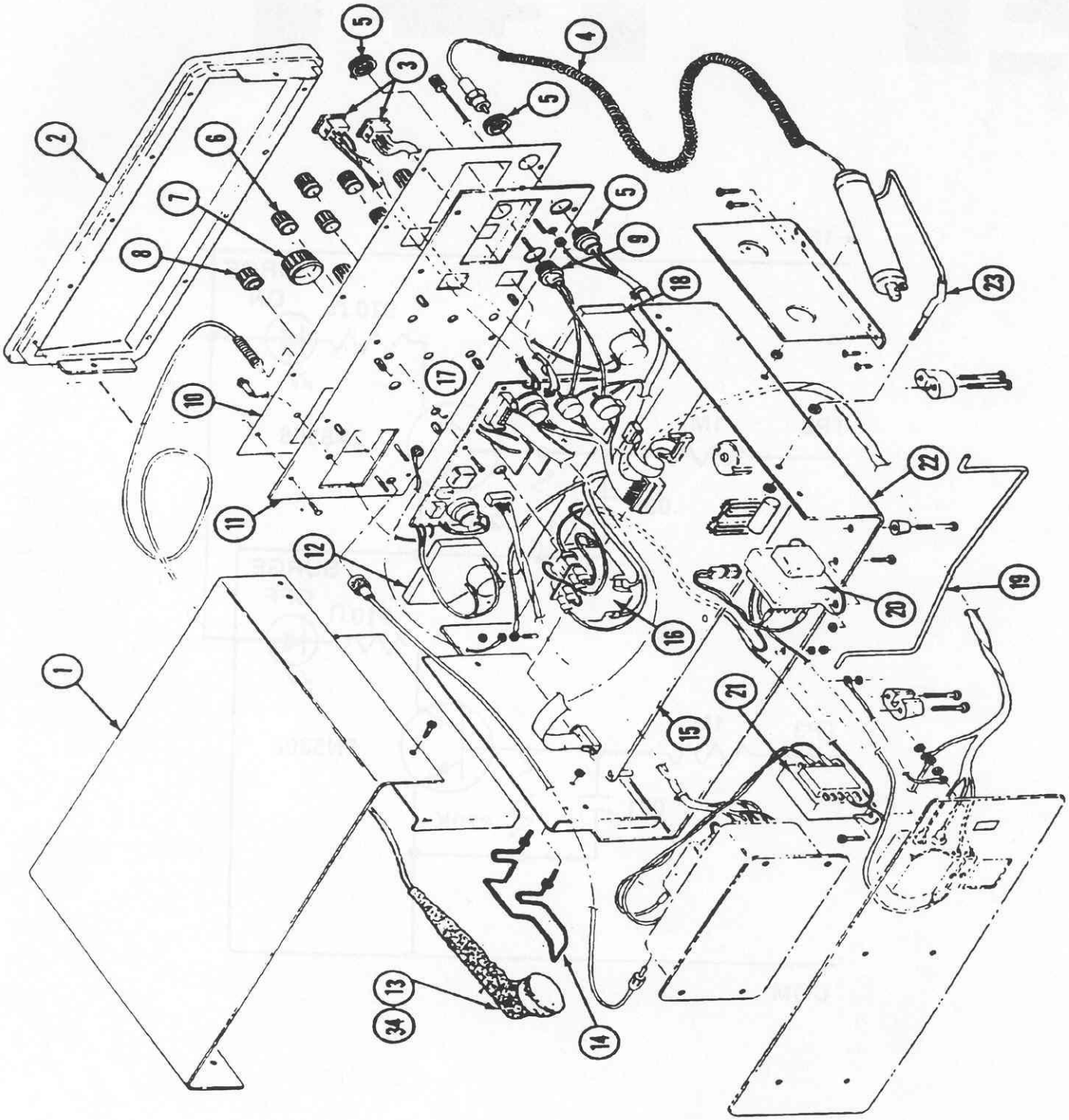
**Schematic 3**

# Surge ON and OFF Indicator



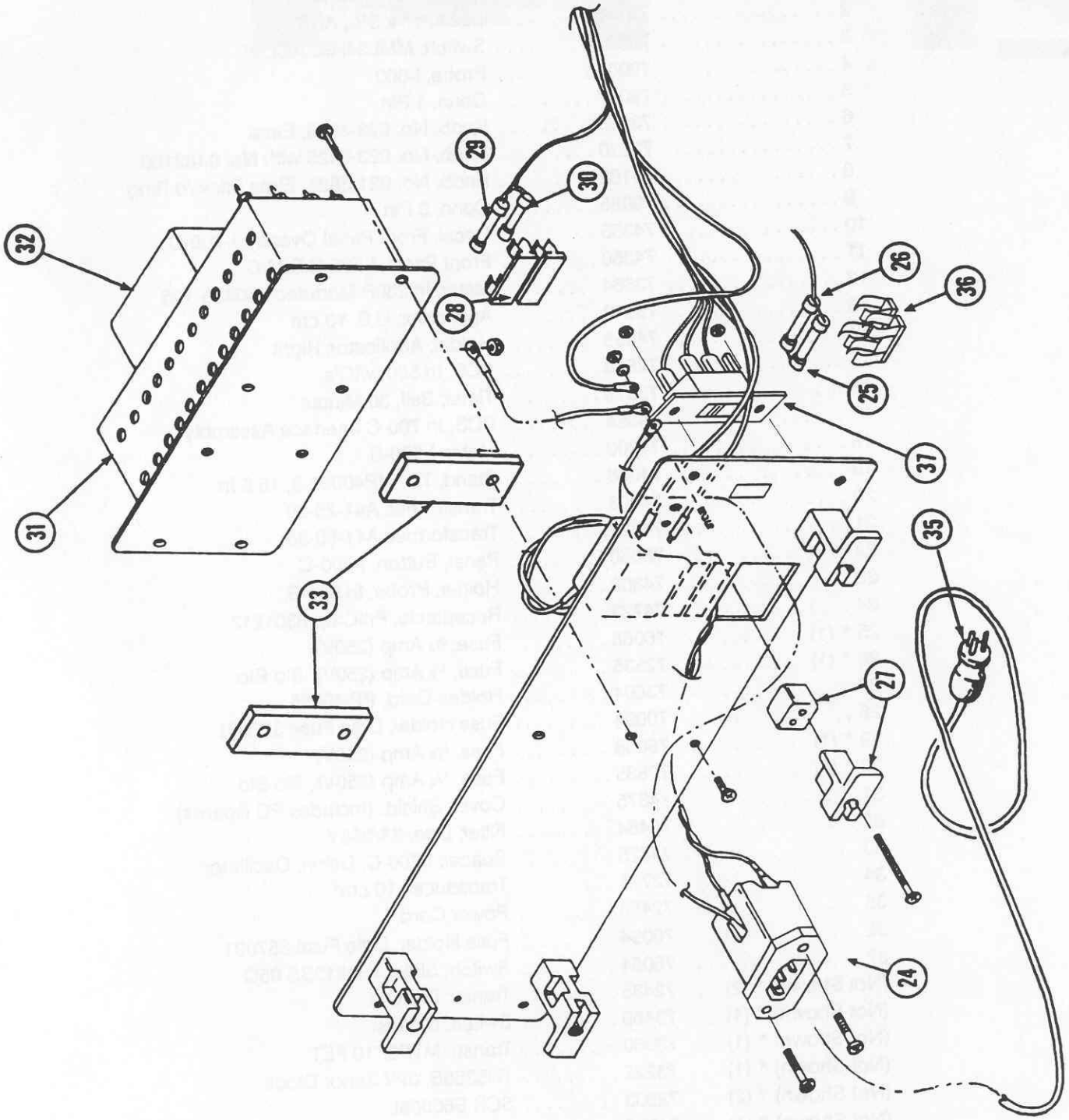

**Schematic 4**

# Intelect® 700-C™ Cabinet Assembly




Schematic 5

# Intelect® 700-C™ Back Panel Assembly



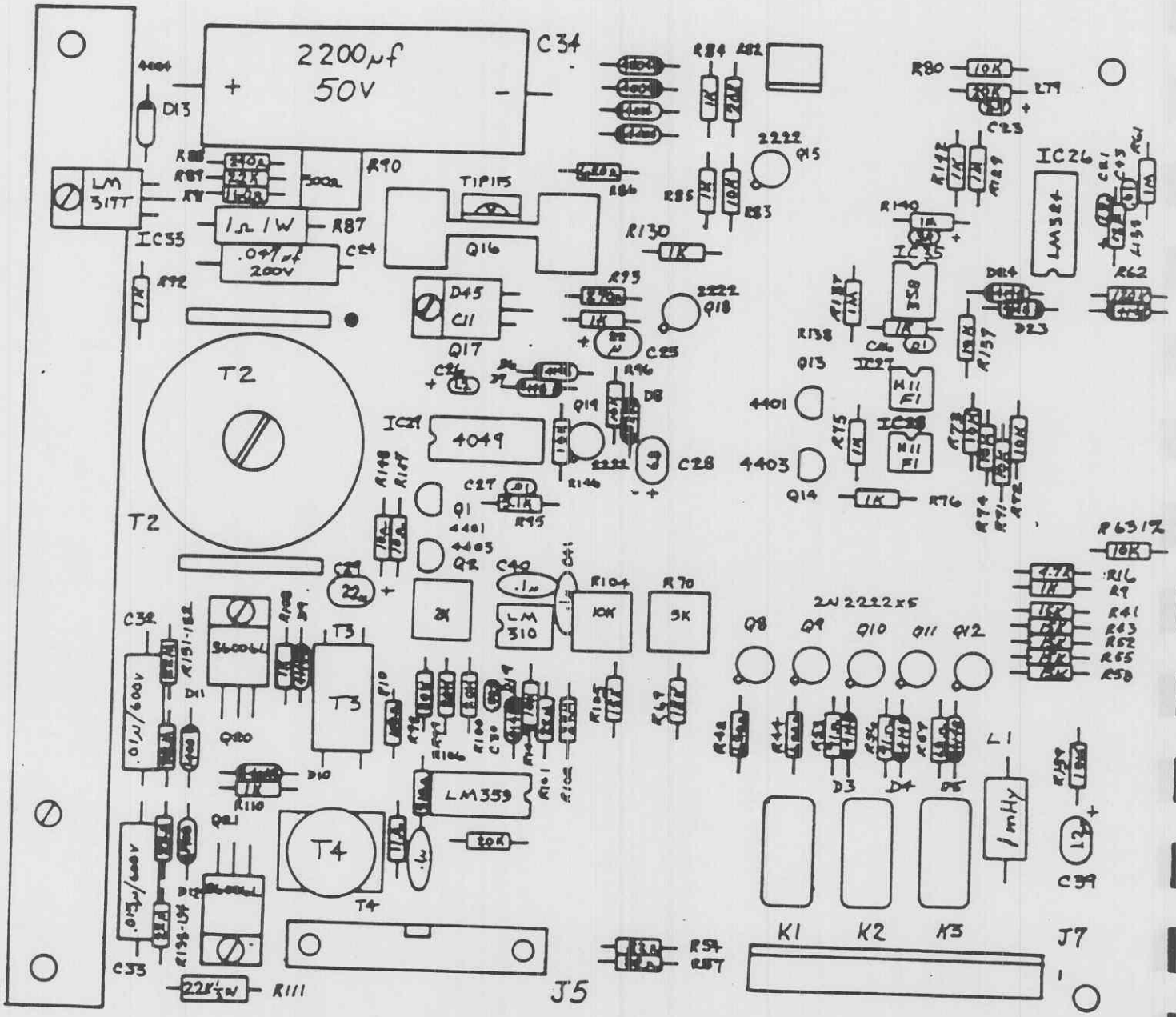

**Schematic 6**

# Itelect® 700-C™ Parts List

| REFERENCE | PART No. | DESCRIPTION |
|---|---|---|
| 1 | 74284 | Top Cover, I-700-C, Pnt |
| 2 | 74116 | Bezel, 17 x 5¾, ABS |
| 3 | 74077 | Switch, MML34HBZACOIK |
| 4 | 79001 | Probe, I-500 |
| 5 | 79087 | Conn, 4 Pin |
| 6 | 73606 | Knob, No. 023-3525, Elma |
| 7 | 73230 | Knob, No. 023-5425 with No. 0482100 |
| 8 | 74162 | Knob, No. 021-3525, Elma Blk w/o Ring |
| 9 | 79085 | Conn, 3 Pin |
| 10 | 74355 | Decal, Front Panel Overlay, I-700-C |
| 11 | 74350 | Front Panel, I-700-C S/M/C |
| 12 | 73664 | Meter, In 230P Modutec 930368-106 |
| 13 | 75642 | Applicator, U.S. 10 cm |
| 14 | 74958 | Holder, Applicator, Right |
| 15 | 72518 | PCB, In 500 w/IC's |
| 16 | 73875 | Timer, Bell, 30 Minute |
| 17 | 74354 | PCB, In 700-C Interface Assembly |
| 18 | 74200 | Meter, I-500-S |
| 19 | 74066 | Stand, Tilt, MP40008-5, 15.5 In |
| 20 | 74203 | Transformer, A41-25-20 |
| 21 | 74322 | Transformer, A41-80-36 |
| 22 | 76060 | Panel, Button, I-700-C |
| 23 | 74303 | Holder, Probe, In 500-S |
| 24 | 74723 | Receptacle, PnlCmp 8301213 |
| 25 * (1) | 76068 | Fuse, ⅜ Amp (250V) |
| 26 * (1) | 72535 | Fuse, ⅛ Amp (250V), Slo-Blo |
| 27 | 73604 | Holder, Cord, PP-40055 |
| 28 | 70094 | Fuse Holder, Little Fuse 357001 |
| 29 * (1) | 76068 | Fuse, ⅜ Amp (250V) |
| 30 * (1) | 72535 | Fuse, ⅛ Amp (250V), Slo-Blo |
| 31 | 74375 | Cover, Shield, (Includes PC Boards) |
| 32 | 70484 | Filter, Line, 3A/250V |
| 33 | 74325 | Spacer, I-700-C, Delrin, Oscillator |
| 34 | 73771 | Transducer, 10 $cm^2$ |
| 35 | 72453 | Power Cord |
| 36 | 70094 | Fuse Holder, Little Fuse 357001 |
| 37 | 76054 | Switch, Slide, V80212SS 05Q |
| (Not Shown) * (2) | 72435 | Transtr, D45C11 |
| (Not Shown) * (1) | 73469 | Switch, Digitast |
| (Not Shown) * (1) | 73960 | Transtr, MTP8P10 FET |
| (Not Shown) * (1) | 73222 | 1N5366B, 39V Zenor Diode |
| (Not Shown) * (2) | 72803 | SCR S60006L |
| (Not Shown) * (1) | 74752 | .01/600V Capacitor |
| (Not Shown) * (1) | 74753 | .015/600V Capacitor |

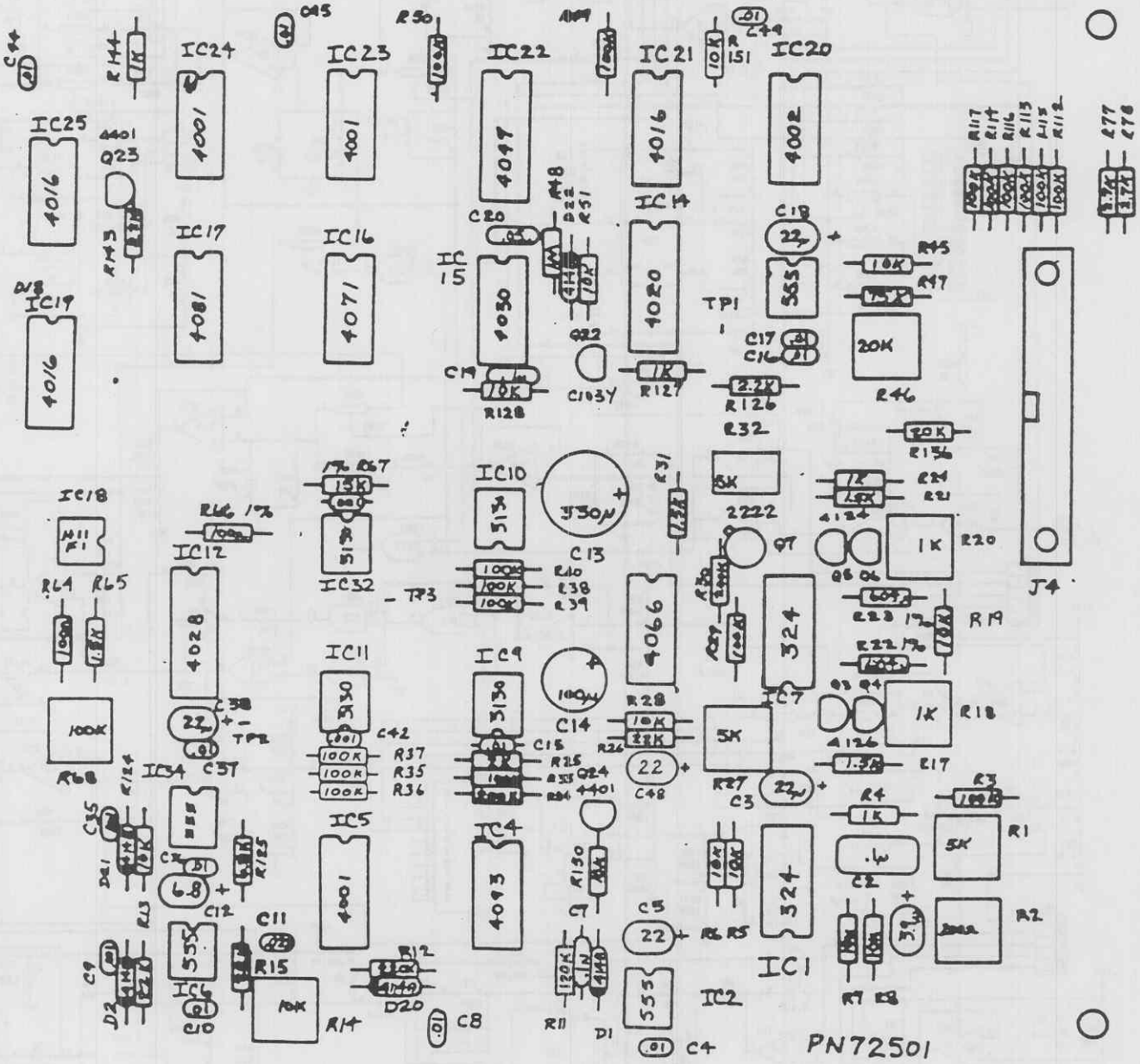
* Parts and their quantities included in the Repair Parts Support Kit

# PCB, Intelect® 700-C,™ 72502



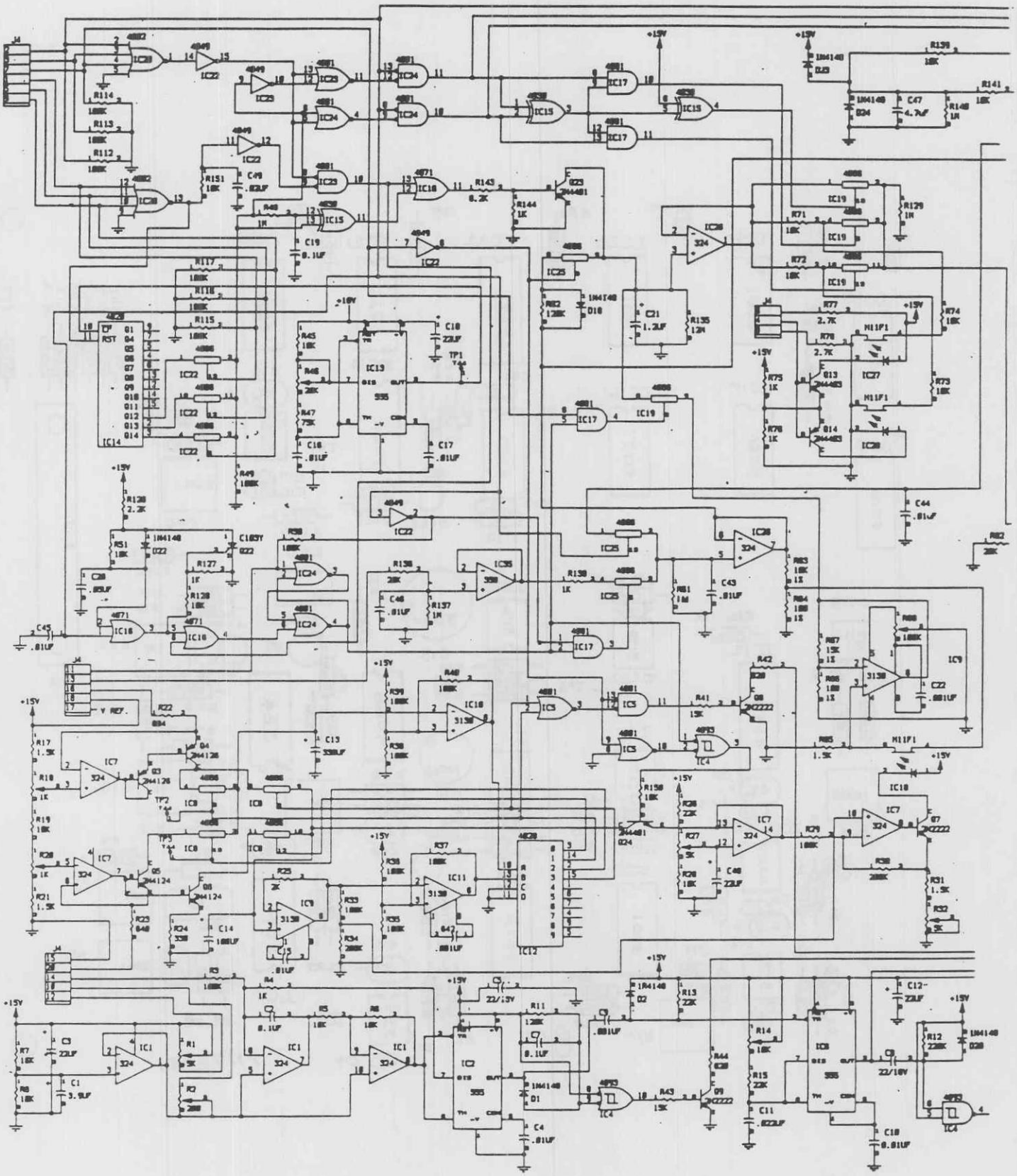

Schematic 7

# PCB, Intelect® 700-C,™ 72502 *(continued)*



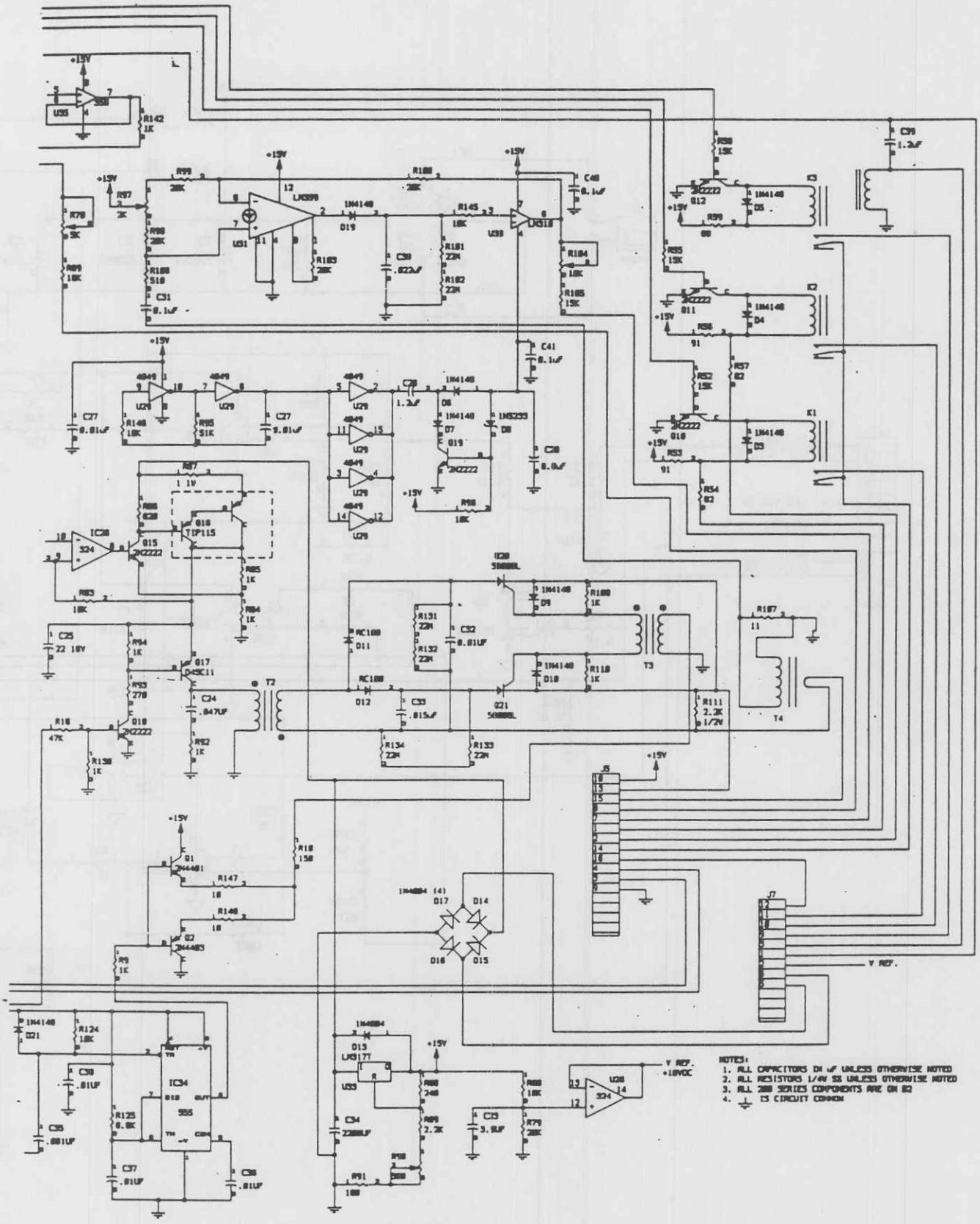

Schematic 7

# Electrical Schematic, Intelect® 700-C,™ ES 72542A



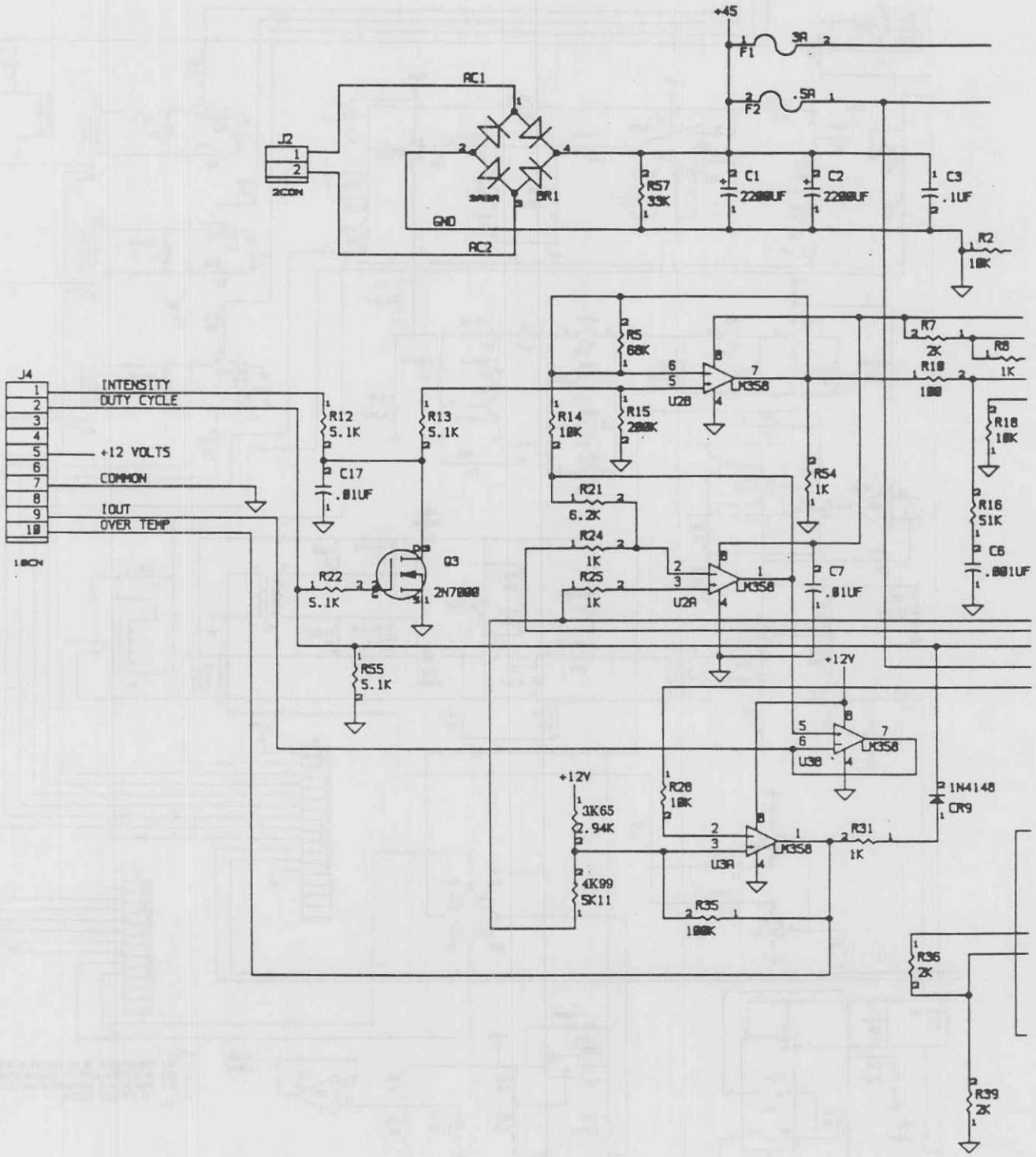
Schematic 8

# Electrical Schematic, Intelect® 700-C,™ ES 72542A *(continued)*



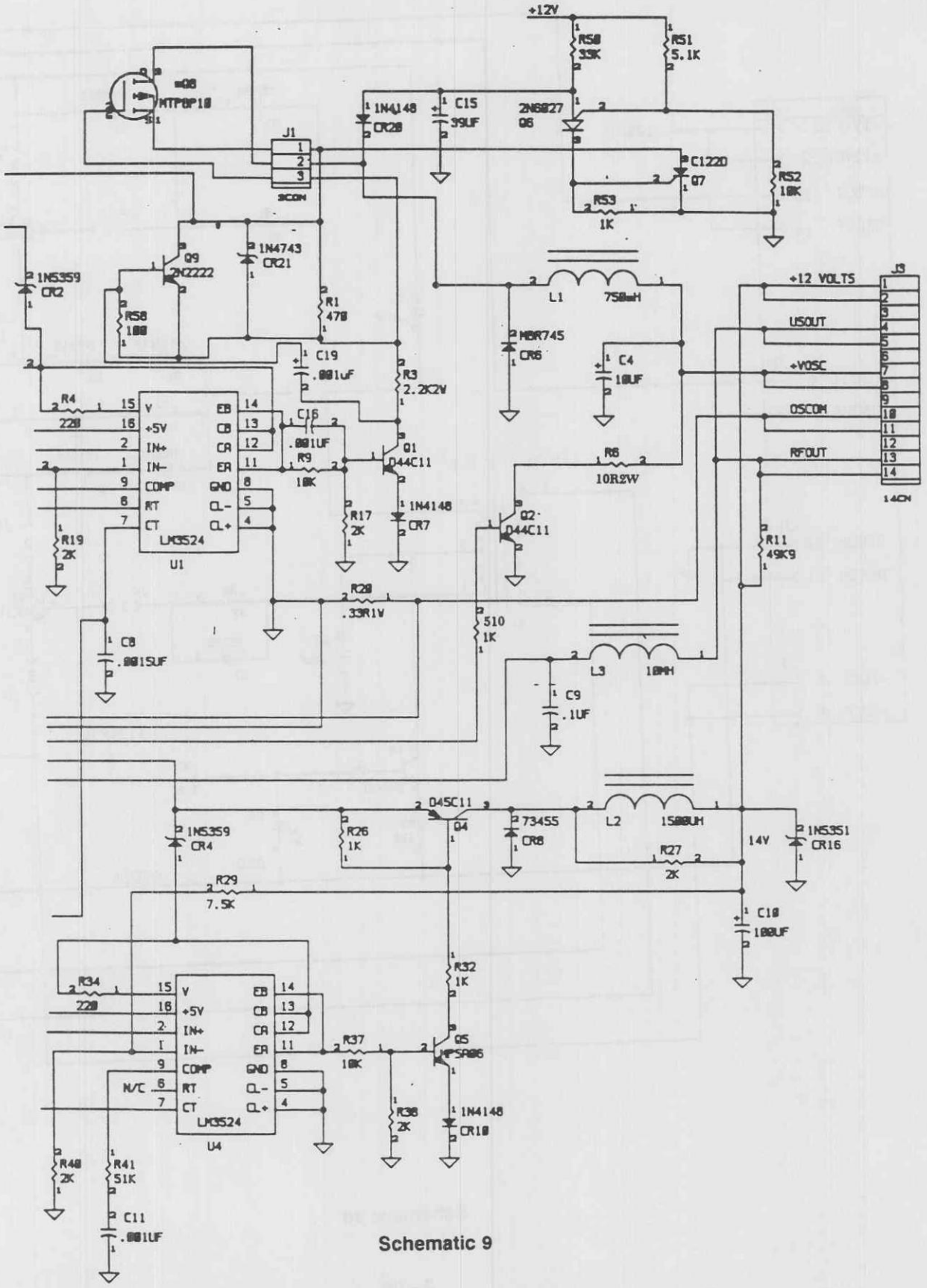

**Schematic 8**

# Electrical Schematic, PCB
# PWR Supply Int. SMP 50w 10cm, S73436-D



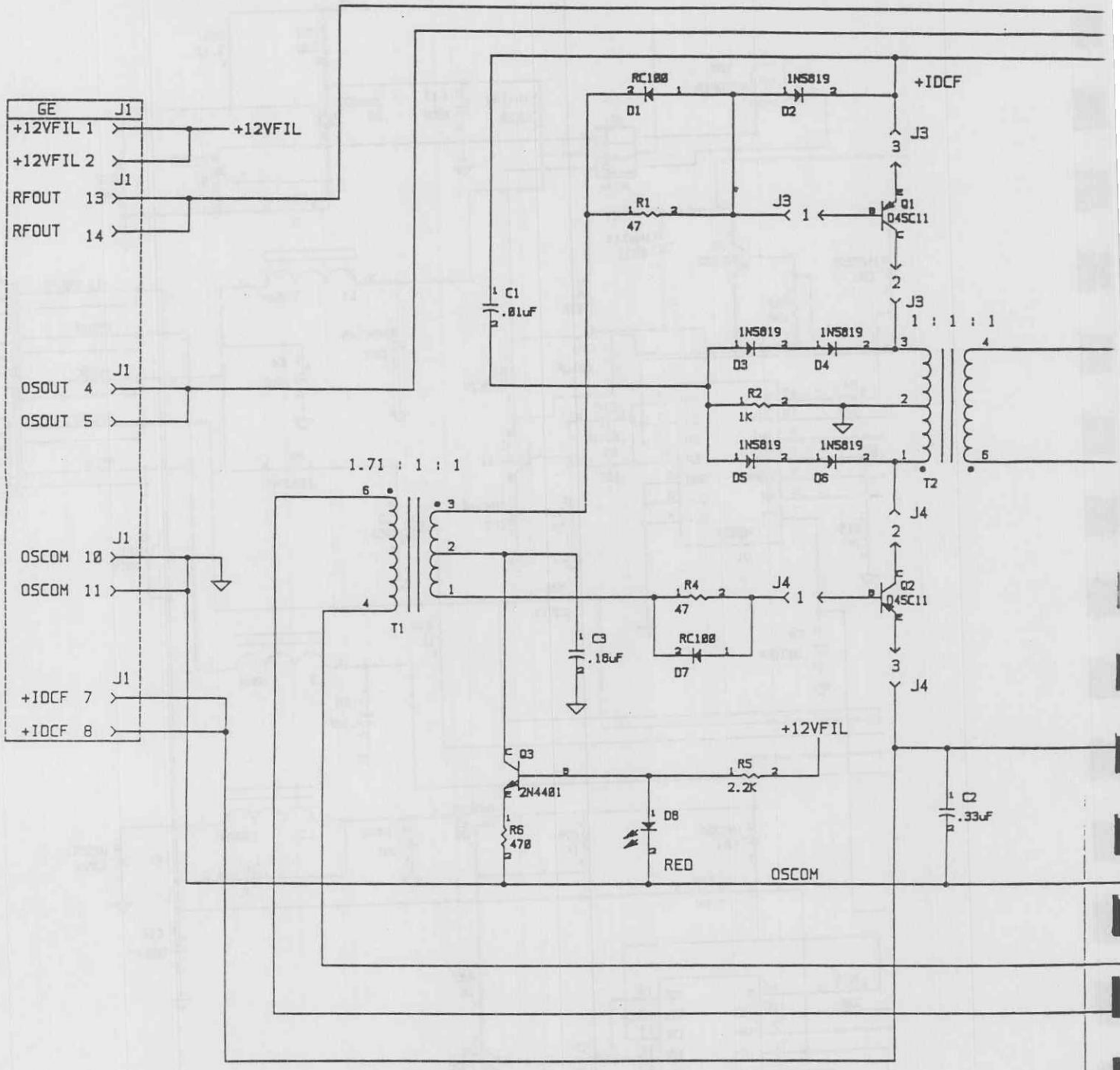

Schematic 9

# Electrical Schematic, PCB
# PWR Supply Int. SMP 50w 10cm, S73436-D *(continued)*



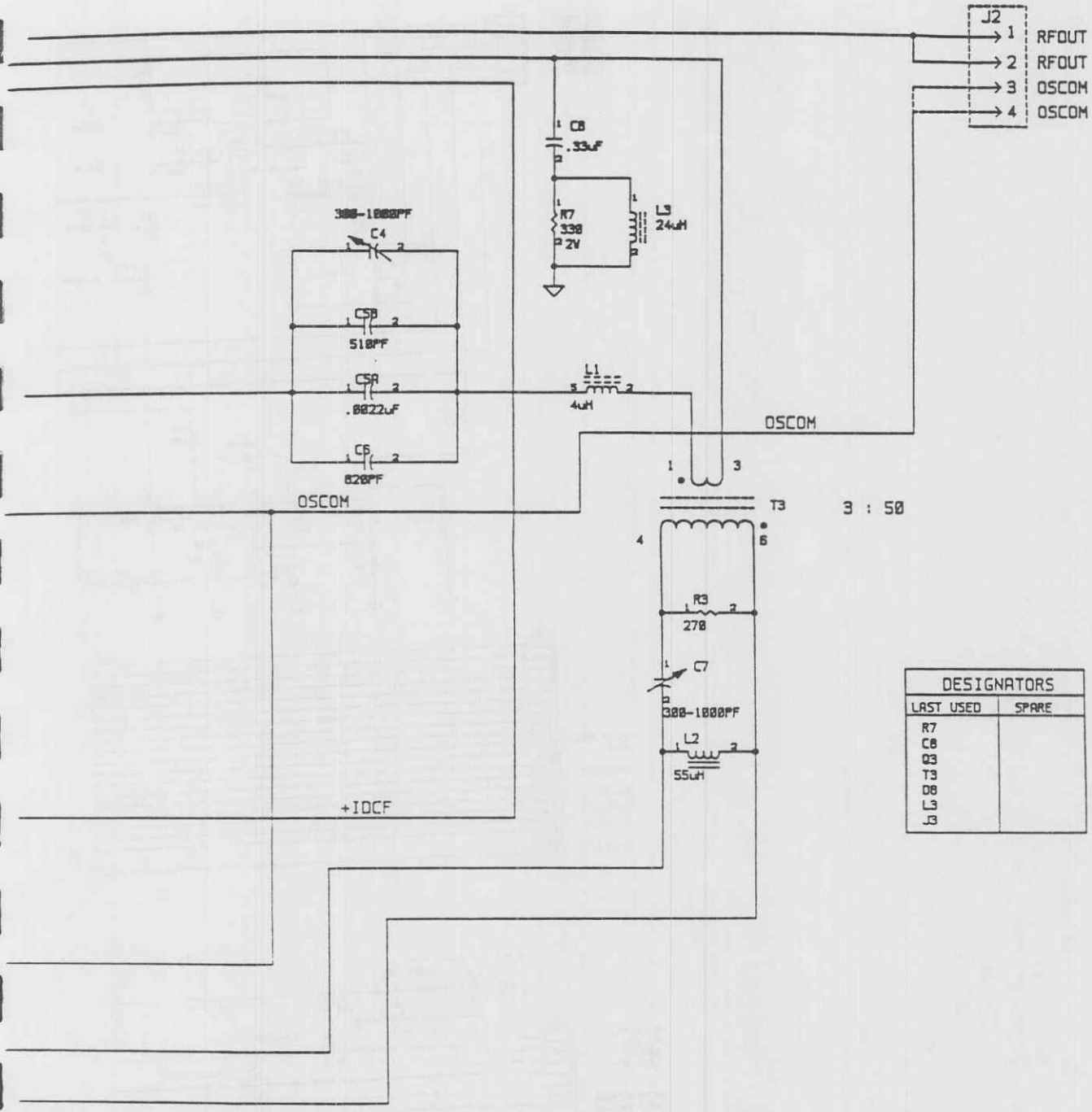

**Schematic 9**

# Electrical Schematic
# PCB Assy. OSC Power, 10cm², ES 71407-E



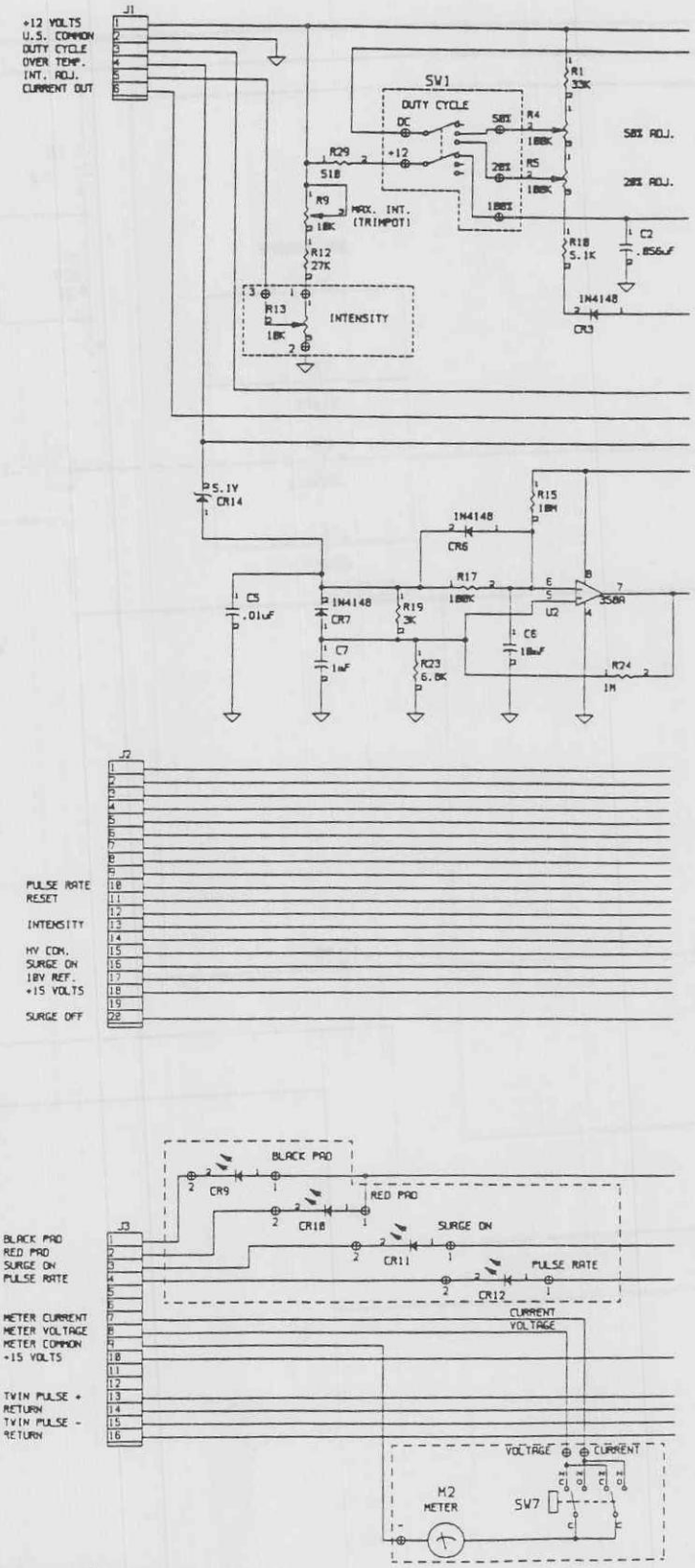

Schematic 10

# Electrical Schematic
# PCB Assy. OSC Power, 10cm², ES 71407-E *(continued)*



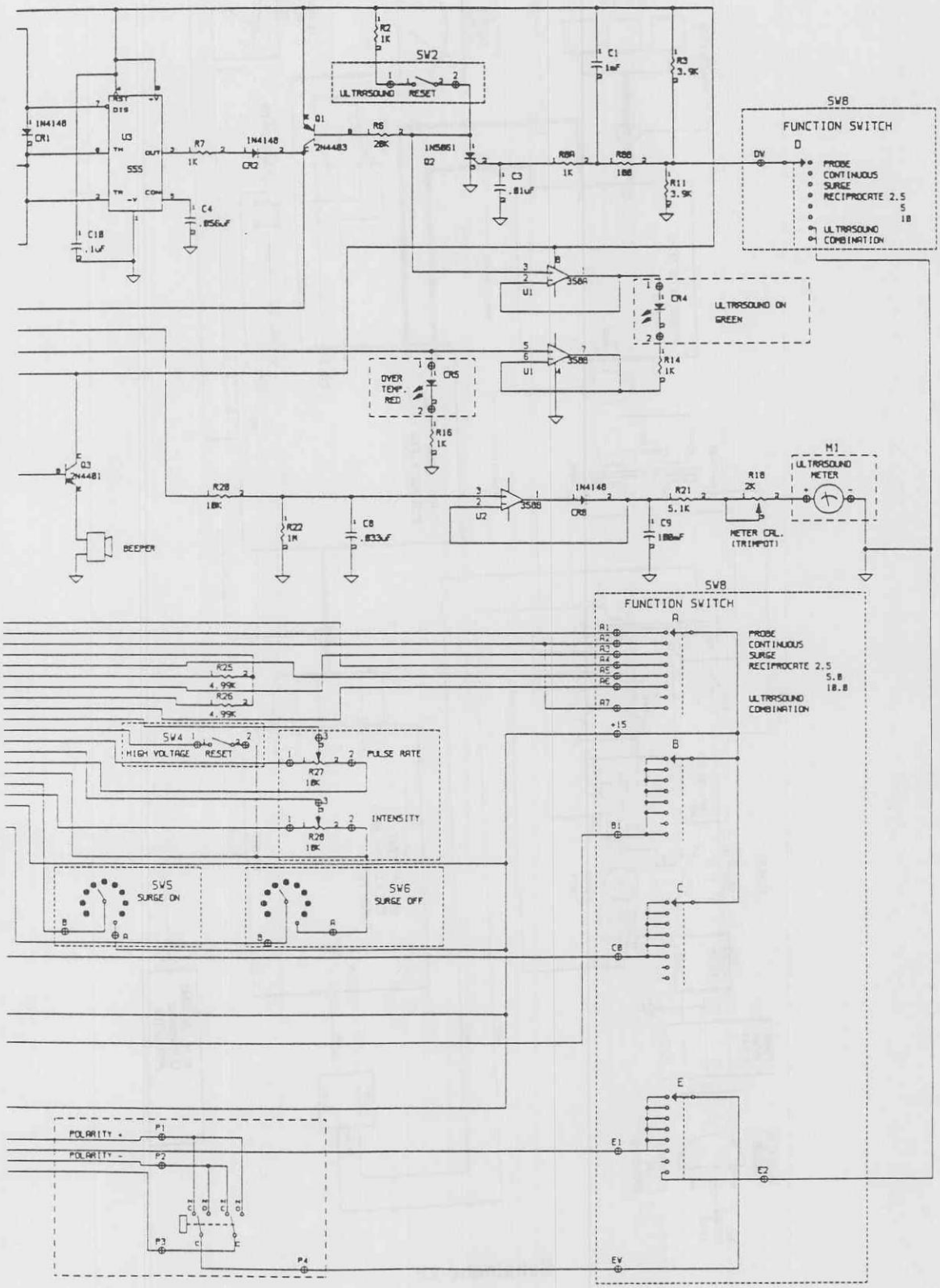

**Schematic 10**

# Electrical Schematic
# Front Panel PCB Intelect® 700-C,™ S74354-A



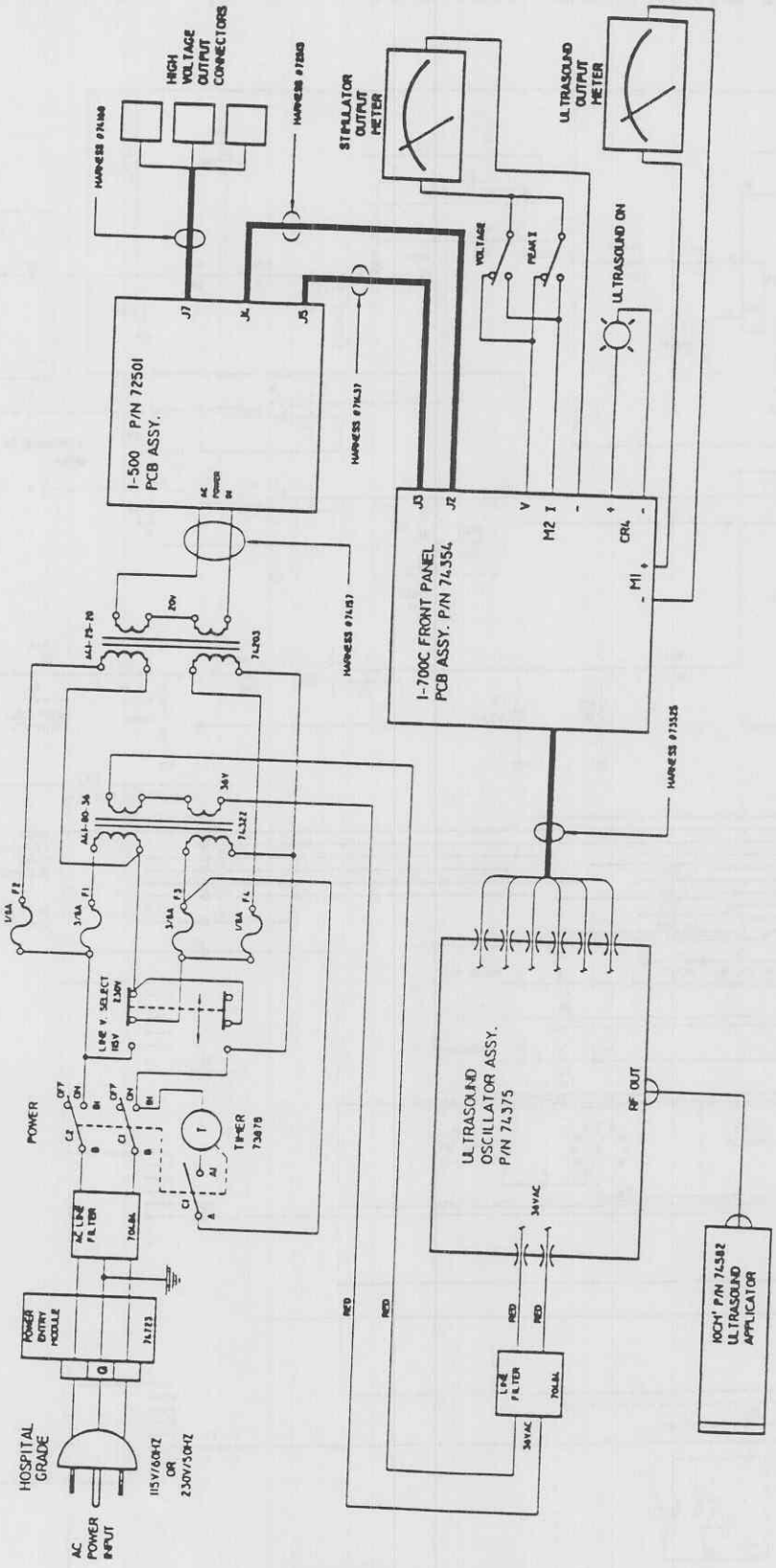

**Schematic 11**

# Electrical Schematic
# Front Panel PCB Intelect® 700-C,™ S74354-A *(continued)*




**Schematic 11**

# Interconnection Diagram
# Intelect® 700-C,™ Dual Voltage




Schematic 12

**CONTRACT** DLA120-93-C-8518 **SERIAL**

intelect®

THERAPEUTIC ULTRASOUND
COMBINATION SYSTEM

**VOLTAGE:** 115 / 230 VOLTS
**FREQUENCY:** 60 / 50 Hz
**WATTS:** 120 WATTS
**LINE CURRENT, MAX.:** 1 AMP (115V)
.5 AMP (230V)

**U.S.**

**MODEL:** 700C
**NSN:** 6515-01-284-6779 **MFR:** 90074